SANbox-8
Fibre Channel Switch
Installer's/User's Manual
Sun StorEdge SAN 3.0 Release

Publication No. 875-3141-10 Rev. A

This revision obsoletes all previous revisions.

The following paragraph does not apply to the United Kingdom or any country where such provisions are inconsistent with local law: THIS PUBLICATION is printed “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions; therefore, this statement may not apply to you.

This publication could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; These changes will be incorporated in new editions of the publication.

It is possible that this publication may contain reference to, or information about, products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that such products, programming, or services will be offered in your country. Any reference to a licensed program in this publication is not intended to state or imply that you can use only the licensed program indicated. You can use any functionally equivalent program instead.

SANbox, SANsurfer, and Multistage are trademarks of QLogic Corporation.

IBM® is a registered trademark of IBM Corporation.

Note to US Government Users – Documentation and programs related to restricted rights – Use, duplication, or disclosure are subject to the restrictions set forth in GSA ADP Schedule Contract.

Table of Contents

Preface

How to Use This Manual 1
Intended Audience 1
Related Materials 2
Safety Notices 3
Sicherheitshinweise 3
Notes informatives relatives à la sécurité 3
Communications Statements 4
- Federal Communications Commission (FCC) Class A Statement 4
- Canadian Department of Communications Class A Compliance Statement 4
- Avis de conformité aux normes du ministère des Communications du Canada 4
- CE Statement 5
- VCCI Class A Statement 6

Laser Safety Information 7
- Labeling Requirements 7

Accessible Parts 8
Pièces Accessibles 8
Zugängliche Teile 8

1 General Description

Introduction 1-1
Major Fibre Channel Port Features 1-2
- Fabric Port Overview 1-3
- Segmented Loop Port (SL_Port) Overview 1-3
- Translated Loop Port (TL_Port) Overview 1-5

Major Switch Chassis Features 1-9
Major Switch Management Features 1-10
Switch Management Tools 1-12
- SANsurfer Switch Management Application 1-12
- Simple Network Management Protocol (SNMP) 1-12

Fibre Channel Ports 1-13
- GigaBit Interface Converters (GBICs) 1-14

Back Panel Controls 1-15
- Power Switch 1-15
- Test Mode Switch 1-15

Back Panel LEDs 1-16

Heartbeat LED (Yellow) 1-16
Switch Logic Power Good LED (Green) 1-16
Fan Fail LED (RED) 1-16
Over Temperature LED (Red) 1-16
Logged-In LED (Green) 1-17
Traffic LED (Yellow) 1-17
AC Input Power Connector and Fuses 1-18
Switch Management Connector 1-18
Ethernet LEDs 1-18
LINK Status 1-18
Activity 1-18

2 Cabling Devices

Bandwidth 2-1
Device Types 2-1
Port Types 2-2
Port Groups and Latency Considerations 2-2
Cable Types 2-3
Fabric Examples 2-3

3 Diagnostics/Troubleshooting

Introduction 3-1
Power Supply Troubleshooting 3-1
Power-On-Self-Test (POST) 3-2
Overview 3-2
Using the Test Mode Switch 3-4
Heartbeat LED Blink Patterns 3-5
Test/Failure Descriptions 3-6
Cable Continuity Tests 3-9

4 Removal/Replacement Procedures

Introduction 4-1
Input Fuse 4-2
Removal 4-2
Replacement 4-3
GBIC 4-4
Removal 4-4
Replacement 4-5
Battery (Repair Depot Only) 4-6

A Reference Information

SANbox-8 Switch Specifications A-1

Switch A-1
Shortwave Laser GBIC (multi-mode) A-5
Longwave Laser GBIC (single-mode) A-5
Copper Inter-Enclosure GBIC (active) A-6
Copper Intra-Enclosure GBIC (passive) A-6

Glossary

Index

List of Figures

Figure 1-1 SANbox-8 Fibre Channel Switch 1-1
Figure 1-2 Segmented Loop Topology Example 1-4
Figure 1-3 SCSI Example 1-6
Figure 1-4 TCP/IP Example 1-7
Figure 1-5 Chassis Back 1-13
Figure 1-6 Typical GBIC 1-14
Figure 2-1 Public Loop Storage Connections 2-4
Figure 2-2 Public Device Connections 2-5
Figure 2-3 Private Segmented Loop Connections 2-6
Figure 2-4 Private Translated Loop Connections 2-7
Figure 3-5 Test Mode Switch 3-2
Figure 3-6 Test Mode Switch Functions and Positions 3-4
Figure 4-1 Removing the Input Fuse 4-2
Figure 4-2 Removing GBICs that have individually operated latches 4-4
Figure 4-3 Removing GBICs that have bail-operated latches 4-5
Figure 4-4 Replacing GBICs 4-5
Figure A-1 SANbox-8 Switch Dimensions in Millimeters (Inches) A-7

Preface

How to Use This Manual

This manual is organized as follows:

- Section 1 is an overview of the Switch. It describes indicator lights and all user controls and connections.
- Section 2 describes the factors to consider when cabling devices to the switch.
- Section 3 contains troubleshooting procedures and explains the Power On Self Test (POST).
- Section 4 contains removal/replacement procedures for all field replaceable units (FRUs).
- Appendix A contains reference information.
- Glossary contains the definitions of commonly used terms.

Please read "Communications Statements" and "Laser Safety Information" presented later in this Preface.

Please use this manual in conjunction with the *SANbox 8/16 Switch Management User's Manual*listed in "Related Materials". The *SANbox 8/16 Switch Management User's Manual* contains information about managing switch chassis through all available means.

Intended Audience

This manual introduces users to the switch and explains its installation and service. It is intended for users competent in installing and servicing electronic equipment.

Related Materials

The following manuals and materials are referenced in the text and/or provide additional information.

- *SANbox 8/16 Switch Management User's Manual*, Publication Number 875-3143-10.
- Fibre Channel-Arbitrated Loop (FC-AL-2) Rev. 6.8
- Fibre Channel-Private Loop SCSI Direct Attach (FC-PLDA) NCITS TR-19:1998
- Fibre Channel-10-bit Interface Rev. 2.3
- Definitions of Managed Objects for the Fabric Element in Fibre Channel Standard (draft-ietf-ipfc-fabric-element-mib-04.txt).

The Fibre Channel Standards are available from:

Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776 Phone: (800) 854-7179 or (303) 397-7956
Fax: (303) 397-2740

Safety Notices

A **Danger** notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. Danger notices appear on the following pages:

4-1

A **Warning** notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury.

A **Caution** notice indicates the presence of a hazard that has the potential of causing damage to the equipment. There is a Caution notice on the following pages:

4-6

Sicherheitshinweise

Ein **Gefahrenhinweis** weist auf das Vorhandensein einer Gefahr hin, die möglicherweise den Tod oder schwere Verletzungen zur Folge hat. Gefahrenhinweise sind auf den folgenden Seiten vorhanden:

4-1

Ein **Warnhinweis** weist auf das Vorhandensein einer Gefahr hin, die möglicherweise mittelschwere oder leichte Verletzungen zur Folge hat.

Ein **Vorsichtshinweis** weist auf das Vorhandensein einer Gefahr hin, die möglicherweise Geräteschäden zur Folge hat. Vorsichtshinweise sind auf den folgenden Seiten vorhanden:

4-6

Notes informatives relatives à la sécurité

Une note informative **Danger** indique la présence d'un risque pouvant entraîner la mort ou des blessures sérieuses. Les notes informatives Danger paraissent aux pages suivantes:

4-1

Une note informative **Avertissement** indique la présence d'un risque pouvant entraîner des blessures légères ou mineures.

Une note informative **Attention** indique la présence d'un risque pouvant entraîner des dégâts matériels. Une notice informative Attention se trouve aux pages suivantes:

4-6

Communications Statements

The following statements apply to this product. The statements for other products intended for use with this product appear in their accompanying manuals.

Federal Communications Commission (FCC) Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense

Neither the provider or the manufacturer are responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications Class A Compliance Statement

This equipment does not exceed Class A limits for radio emissions for digital apparatus, set out in Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps necessary to correct the interference.

Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques por les appareils numériques, telles que prescrites par le Réglement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécwssaires pour en éliminer les causes.

CE Statement

The CE symbol on the equipment indicates that this system complies with the EMC (Electromagnetic Compatibility) directive of the European Community (89/336/EEC) and to the Low Voltage (Safety) Directive (73/23/EEC). Such marking indicates that this system meets or exceeds the following technical standards:

- **EN60950/A11:1997** "Safety of Information Technology Equipment, Including Electrical Business Equipment".
- **EN60825-1:1997** "Safety of Laser Products, Part 1.
- **EN 55022 (CISPR 22) Class A** "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment".
- **EN 50082-1/1997** "Electromagnetic compatibility - Generic immunity standard Part 1: Residential commercial, and light industry."
  - **IEC1000-4-2/1995** "Electrostatic Discharge Immunity Test"
  - **IEC1000-4-3/1995** "Radiated, Radio-Frequency, Electromagnetic Field Immunity Test"
  - **IEC1000-4-4/1995** "Electrical Fast Transient/Burst Immunity Test"
  - **IEC1000-4-5/1995** "Surge Immunity Test"
  - **IEC1000-4-6/1996** "Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields"
  - **IEC1000-4-8/1993** Power Frequency Magnetic Field Immunity Test"
  - **IEC1000-4-11/1994** "Voltage Dips, Short Interruptions And Voltage Variations Immunity Tests"
- **EN61000-3-2/1995** "Limits For Harmonic Current Emissions (Equipment Input Current Less Than/Equal To 16 A Per Phase)". Class A
- **EN61000-3-3/1995** "Limitation Of Voltage Fluctuations And Flicker In Low-Voltage Supply Systems For Equipment With Rated Current Less Than Or Equal To 16 A".
- **ENV50204/1995** "Radio Frequency Susceptibility, Keyed Carrier"

VCCI Class A Statement

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

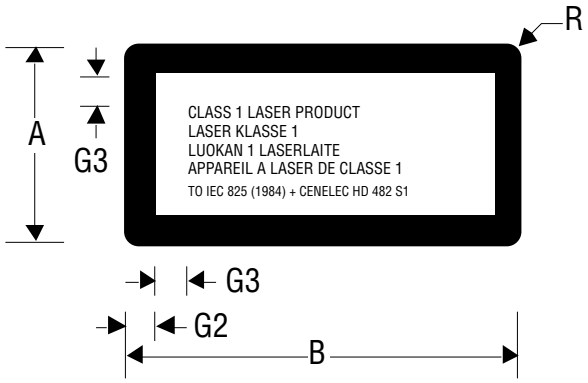
This is a Class A product based on the standard of the Voluntary Control Council For Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Laser Safety Information

This product may use Class 1 lasers to communicate over the fiber optic conductors. The U.S. Department of Health and Human Services (DHHS) does not consider Class 1 lasers to be hazardous. The International Electrotechnical Commission (IEC) requires labeling information that states that the lasers are Class 1.

Labeling Requirements

There are no caution or danger labels required for use of the optical Gigabit Interface Converter (GBIC) since it is a Class 1 laser component assembly. Within the U.S., the only laser safety label required is the certification label that already appears on the plastic retainer of the optical GBIC assembly. Outside of the U.S., the IEC 825 laser safety standard requires that the system level product have a Class 1 information label permanently attached and clearly visible whenever access to the optical ports is possible. This label is supplied with the equipment and applied by the user during the installation procedure. An example of the IEC Class 1 information label and its dimensions, suitable for use in most European countries, is shown below. The label consists of black printing on a yellow background. The languages represented on this example label are English, German, Finnish, and French and represent the minimum set for acceptance of a Class 1 product in most European countries.



Dimensions in mm

A x B	G2	G3	R
26 x 52	4	4	2
52 x 105	5	5	3.2
74 x 148	6	7.5	4

Accessible Parts

Field Replaceable Units (FRU) in the SANbox-8 Fibre Channel Switch are:

- fuses associated with the AC input power
- interfaces to the interconnection media called GBICs

Refer to Section 4 Removal/Replacement Procedures for more information.

Pièces Accessibles

Les pièces remplaçables, Field Replaceable Units (FRU), du commutateur SANbox-8 Fibre Channel Switch sont les suivantes:

- fusibles associés à l’alimentation d’entrée c.a
- interfaces avec les supports de raccordement, appelées GBIC,

Pour plus d’informations, voir la Section 4 (Procédures de retrait et de remplacement).

Zugängliche Teile

Die FRUs (Field Replaceable Units) im SANbox-8 Fibre Channel Switch sind wie folgt:

- Sicherungen für die Netzversorgung
- Schnittstellen zu den Verbindungsmedien, GBICs

Für weitere Informationen siehe Abschnitt 4 (Ausbau-/Austauschverfahren).

Section 1 General Description

Introduction

The SANbox™-8 Fibre Channel Switch is the Fabric component of a Fibre Channel (FC) compliant network. Figure 1-1 is an illustration of the Switch. This manual describes the Switch as a full-featured fabric Switch unless otherwise specified. Air flow through the SANbox-8 switch is front-to-back.

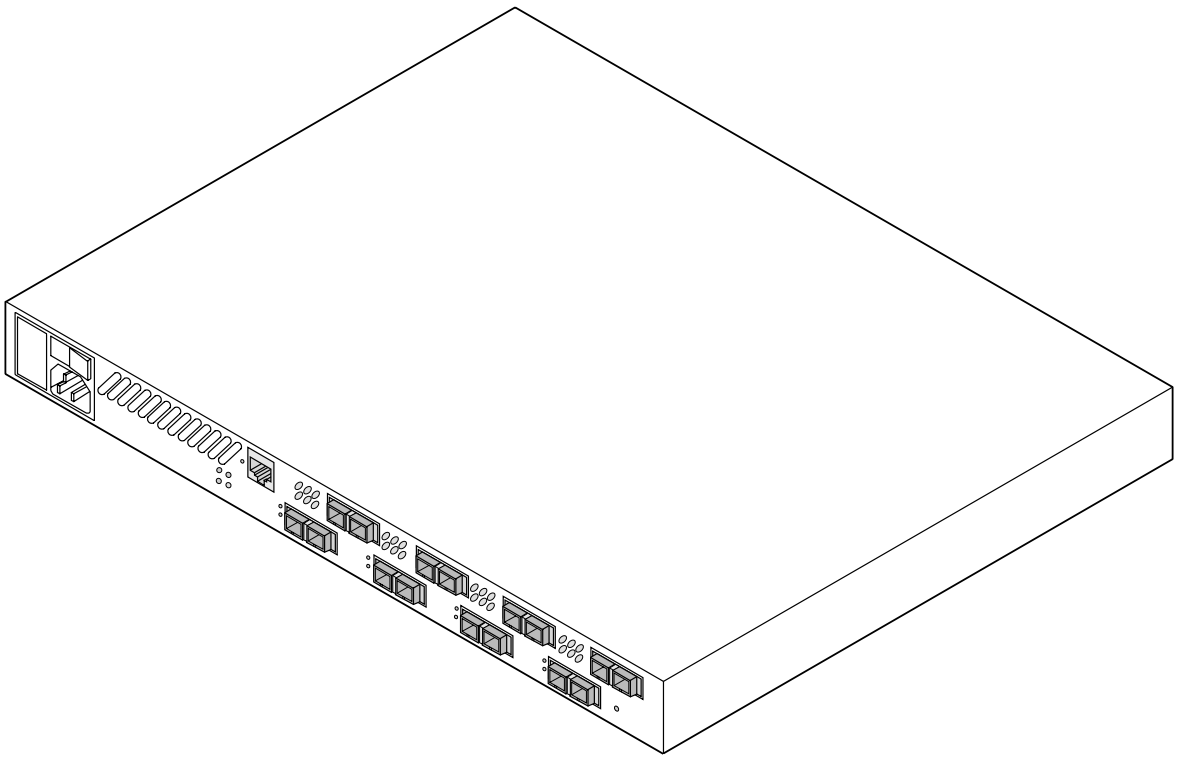


Figure 1-1 SANbox-8 Fibre Channel Switch

Major Fibre Channel Port Features

Major Fibre Channel port features include:

- Each Switch chassis has 8 Fibre Channel ports. Each port operates at 1062.5 megabaud.
- Any or all eight ports may be:

  Fabric Ports Fabric ports connect to fibre channel public devices and device loops. A fabric port is self configuring as an F_Port for a public device or as an FL_Port for a loop of public devices. Refer to "Fabric Port Overview" on page 1-3.

  SL_Ports. Segmented Loop Ports (SL_Ports) allow you to divide a Fibre Channel Private Loop into multiple segments. Each segment of the loop can pass frames around as an independent loop and can also connect through the fabric to other segments of the same loop. Refer to "Segmented Loop Port (SL_Port) Overview" on page 1-3.

  TL_Ports. Each Translated Loop Port (TL_Port) connects to a private loop and allows connectivity between the private loop devices on the loop and "off-loop" devices (devices not connected to that particular TL_Port) such as Public fabric devices. Refer to "Translated Loop Port (TL_Port) Overview" on page 1-5.

  T_Ports. Trunk Ports (T_Ports) allow the interconnection of multiple chassis to form larger fabrics.
- All ports support Class 2 and Class 3 Fibre Channel service. Refer to Appendix A Reference Information.
- The Switch supports the maximum Fibre Channel frame size (2148 bytes) for Class 2 and 3 Fibre Channel service. Refer to Appendix A Reference Information for more information.
- All ports are supported by GigaBit Interface Converters (GBICs). GBICs contain the transmitters and receivers that connect to the interconnection media. Each GBIC is "hot pluggable".
- Each port has eight buffer credits. This feature allows a cable length up to 13 km at 1 Gbps without performance degradation. Cable length is also dependant on the type of GBIC used. Refer to Appendix A Reference Information for more information.
- You may populate 2 to 8 ports with GBICs. The choice of ports and GBICs is yours.

- The Switch has been validated with GBICs that support a variety of interconnection media. Refer to "Fibre Channel Ports" on page 1-13 for more information.

Fabric Port Overview

All ports on the SANbox-8 chassis are "loop-aware" fabric ports. Through the Fibre Channel Fabric Login process, each port discovers the devices connected to it. When connected to a single public device through a node port (N_Port), a fabric port will self-configure as an F_Port. When connected to a loop of public devices through a node loop port (NL_Port), a fabric port will self-configure as an FL_Port. Fabric ports connect to public devices that conform to the Fibre Channel Standards.

Switch management allows you to force a fabric port to function as an F_Port. Refer to the *SANbox 8/16 Switch Management User's Manual*. The attributes of F_Ports and FL_Ports are described in the Fibre Channel Standards.

Segmented Loop Port (SL_Port) Overview

You may use Switch management to configure any or all ports on the SANbox-8 chassis as Segmented Loop ports (SL_Ports). SL_Ports connect to devices which conform to the Fibre Channel-Private Loop SCSI Direct Attach (FC-PLDA) standard. SL_Ports allow you to divide these Private Loops into multiple segments which may communicate through the Switch as though they were all part of the same private loop.

Figure 1-2 shows a possible topology of a Segmented Loop. In this figure, there are four distinct segments that have been linked together by the Switch as a single Segmented Loop. This means that all the segments share the same address space; that is, the same set of Arbitrated Loop Physical Addresses (AL_PA). All devices on the Segmented Loop can see all other devices as though they were attached to their segment. For example, Server 1 and Sever 2 have access to each other and to both storage devices ST1 and ST2.

A Segmented Loop has greater performance than a hub (unsegmented loop), because a Segmented Loop can have multiple concurrent frame transfers (one per segment) while a hub can have only one. For example, from Figure 1-2, Server 1 can initiate an exchange of data with ST1 while at the same time, Server 2 is initiating an exchange with ST2.

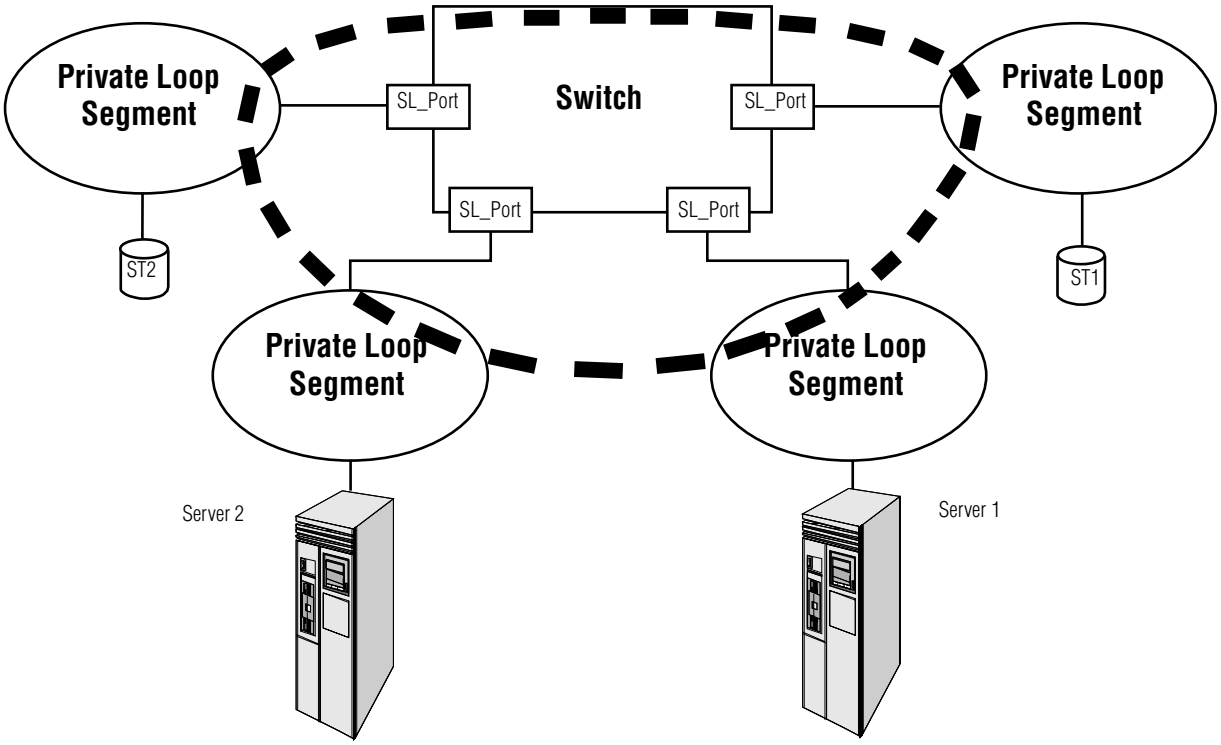


Figure 1-2 Segmented Loop Topology Example

Segmented Loop Features

- Switch management allows you to designate any or all ports on a SANbox-8 chassis as SL_Ports.
- SL_Ports connect to devices that conform to the Fibre Channel-Private Loop SCSI Direct Attach (FC-PLDA) standard. If you place a Public Fibre Channel device on an SL_Port it becomes a Private device and (like other Private devices) cannot communicate off the loop.
- Each SL_Port can support up to 126 devices.
- Each SL_Port automatically discovers the devices connected to it.
- Switch management allows you to link up to 32 segments (SL_Ports) together in the same segmented loop zone (even across multiple chassis in the same fabric) to form a segmented private Loop. The aggregate total number of devices in the linked SL_Ports must not exceed 126 devices and all AL_PAs within the linked segments must be unique.
- Devices in the same segmented loop zone communicate with one another as though they were on the same physical loop.

- Devices on SL_Ports cannot communicate with devices on F, FL or TL_Ports. They also cannot communicate with devices on SL_Ports which are not in the same segmented loop zone.
- Devices connected to SL_Ports are **not** registered with the Name Server.
- Each loop segment may have a Fibre Channel Frame in process.
- You may have as many loop segments as you have SL_Ports. That is, if none of them are zoned together, each SL_Port would contain one set of AL_PA and each AL_PA within that loop must be unique.
- The Switch supports all SCSI/FCP and TCP/IP frames.
- SL_Ports support Class 2 and 3 Fibre Channel Service.

SL_Port Management

Refer to the *SANbox 8/16 Switch Management User's Manual* for more information. The SANsurfer™ Web-based Switch management application provides the following:

- The user may choose which ports (if any) are SL_Ports.
- The user may place up to 32 SL_Ports together in the same segmented loop zone to form a Segmented Loop.
- The application provides a map of all AL_PAs on a Segmented Loop. This viewable map includes information about which AL_PA address are being used by the SL_Port.
- The application provides a way to flag error conditions to the user.
- All management configuration information is stored in nonvolatile memory.

SL Private Loop Stage Type

Switch management allows you to define all chassis in the fabric as SL Private Loop stage types. This stage type defines all ports on a chassis as SL_Ports and links them into one segmented loop. You define the fabric stage type in the SANsurfer Topology Window. Refer to the *SANbox 8/16 Switch Management User's Manual* for more information.

Translated Loop Port (TL_Port) Overview

You may use Switch management to configure any or all ports on the SANbox-8 chassis as Translated Loop ports (TL_Ports). TL_Ports connect to devices which conform to the Fibre Channel-Private Loop SCSI Direct Attach (FC-PLDA) standard. Each TL_Port allows connectivity between the Private Loop devices on the loop and "off-loop" devices (devices not connected to that particular TL_Port) such as Public devices connected to F and FL_Ports and private devices on other

TL_Port loops. This connectivity is achieved by having a translation function at each TL_Port which translates private frames to public frames and vice versa.

Figure 1-3 shows possible Fabric topologies with both public and Private SCSI devices. In this figure, the TL_Ports are ports with Translation Mode functions. The following three scenarios are supported by TL_Ports:

- Server 1 to ST1 (Public Initiator to/from Private Target)
- Server 2 to ST2 (Private Initiator to/from Public Target)

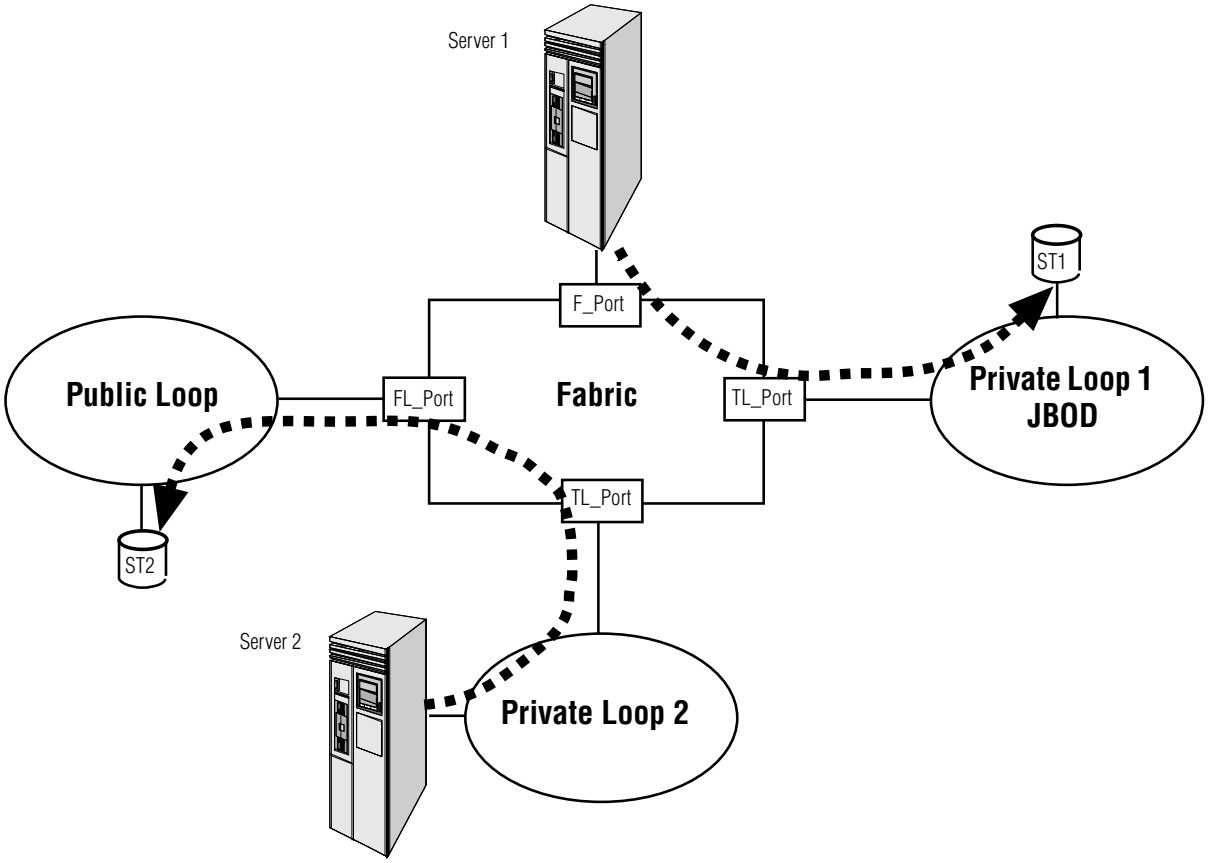


Figure 1-3 SCSI Example

TCP/IP protocols are also supported. Figure 1-4 shows possible topologies for TCP/IP:

- Server 1 to and from Server 2 (Public device to/from Private device)
- Server 3 to and from Server 2 (Public device to/from Private device).

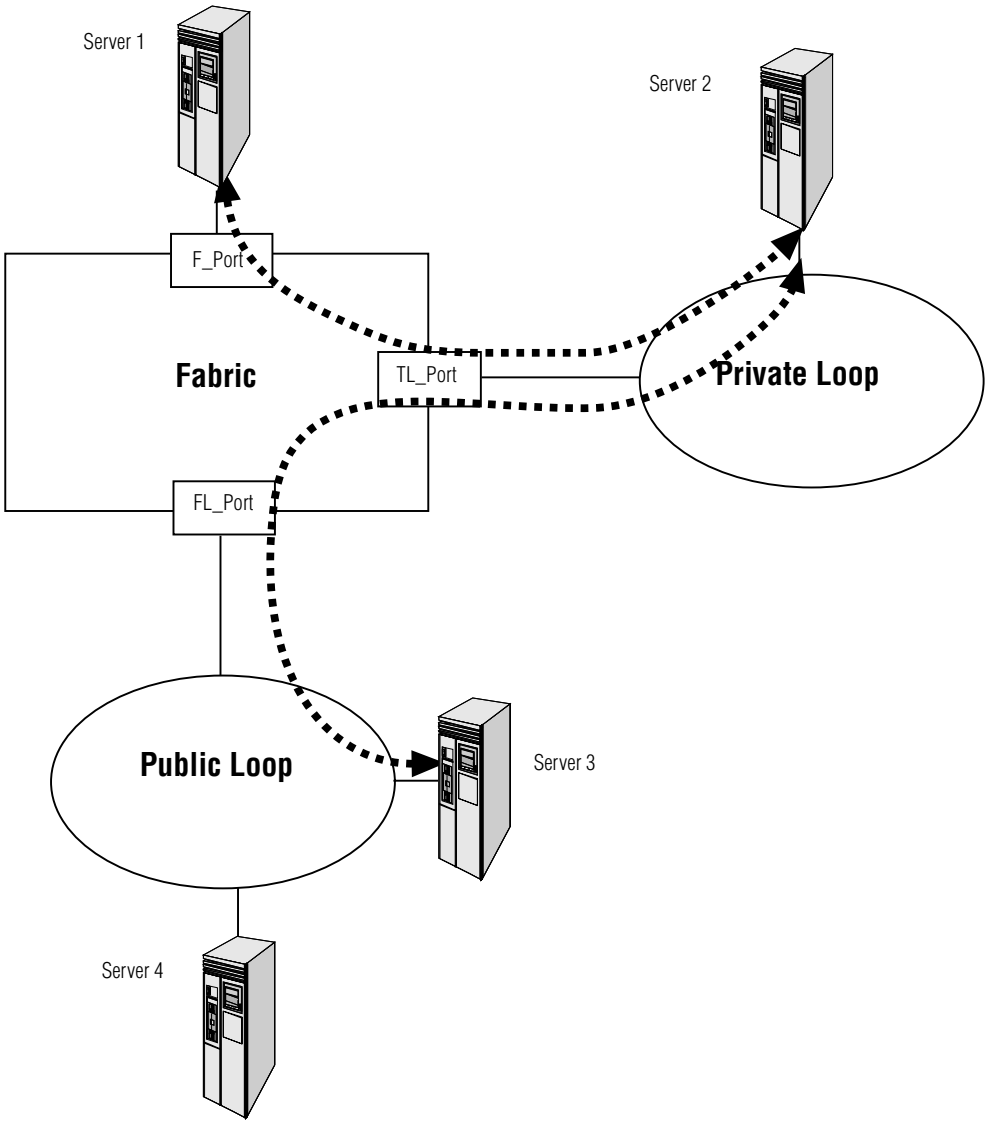


Figure 1-4 TCP/IP Example

Translated Loop Features

- Each TL_Port maintains up to 125 AL_PA addresses on the Private Loop. When one of these AL_PA addresses communicates with an “off-loop” device, the TL_Port acts as a proxy for the off-loop device on the Private Loop. This means that the TL_Port handles all loop primitives on behalf of the off-loop device.
- Each TL_Port may proxy up to 31 off-loop devices. These off-loop devices must be public devices (connected to F, or FL_Ports).
- The set of off-loop devices that a single TL_Port may proxy may overlap or exclude the devices accessed by other TL_Ports in the same fabric.
- The set of off-loop devices proxied by a TL_Port is contained in its translation entries list.

  The translation entries list for a TL_Port connected to **Private targets** will contain the public initiators that try to communicate with those targets. Each initiator that logs into to a TL_Port connected to private targets is automatically added to the TL_Port’s translation entries list. Use zoning to limit the number of potential initiators.

  The translation entries list for a TL_Port connected to **Private initiators** will contain up to 31 public targets that you want the private initiator to communicate with. Entries to this list must be made explicitly using the SANsurfer switch management application.
- Devices on TL_Ports cannot communicate with devices on SL_Ports.
- TL_Ports support broadcast.
- Multiple TL_Ports can coexist in a single fabric. They may be zoned to control access.
- Devices connected to TL_Ports are registered with the Name Server.
- The user must identify public initiators for each TL_Port.
- TL_Ports support all SCSI/FCP frames.

NOTE:
Third Party SCSI commands (i.e. Third Party RESERVE, COPY, XOR) are not supported. A Third Party SCSI command is any command that has a target address embedded in the command (i.e. embedded in the Fibre Channel frame payload).

- TL_Ports support TCP/IP.

TL_Port Management

Refer to the*SANbox 8/16 Switch Management User's Manual* for more information. The SANsurfer application provides the following:

- The user may choose which ports (if any) are TL_Ports.
- The user may use Name Server Zoning or Hard Zoning to limit the number of public devices that have access to a TL_Port to 31 devices or less.
- The user may manage the translation entries list for any TL_Port connected to Private initiators. That is, the user may identify all off-loop targets for the initiators on the particular TL_Port.
- The SANsurfer application provides a map of all AL_PAs on a Translated Loop. This viewable map includes information about which AL_PA addresses are being used by the TL_Port.
- The SANsurfer application provides a way to flag error conditions.
- All switch configuration information is stored in non-volatile memory.
- The user may clear the stored configuration information.

Major Switch Chassis Features

The following is an overview of the major features of the Switch chassis:

- A chassis can be defined as one of two stage types: Input-Output/Transfer (IO/T) or SL Private Loop. All chassis in a fabric must be the same stage type. An IO/T chassis supports all port types (F, FL, SL, TL, and T). An SL Private Loop chassis supports SL_Ports and T_Ports. Refer to "SL Private Loop Stage Type" on page 1-5 for more information.
- The Switch undergoes Power-On-Self-Tests (POSTs) each time it is powered-up. POST provides one pass through the tests, but does not test the GigaBit Interface Converters (GBICs). The POST uses the Heartbeat LED to indicate pass or fail test conditions. Refer to "Heartbeat LED (Yellow)" on page 1-16 and "Power-On-Self-Test (POST)" on page 3-2.
- LEDs indicate the status of the Switch and each port. Refer to "Back Panel LEDs" on page 1-16.
- The Switch contains an RJ-45 Ethernet connector that provides a management connection to the outside world. The user can use a management station connected via this network to manage the Switch. Refer to Section 2 Cabling Devices and the *SANbox-8/16 Switch Management User's Manual* for more information.
- Air flow in through the switch is front-to-back.

Major Switch Management Features

Switch management allows you to:

- Configure the Switch Management interface with its IP network configuration parameters
- View the fabric Ethernet connection
- View hardware and firmware version information for the selected chassis
- View Switch Names and World Wide Names (WWN) of all chassis
- View port addresses on the selected chassis
- Configure chassis parameters such as:
  - Switch Name
  - Chassis Number
  - Administration Mode (Online or Offline)
- Query and identify switches in the fabric by MAC address using Reverse Address Resolution Protocol (RARP).
- View dynamic graphs that display performance data for each On Line port on the selected chassis. Performance data includes:
  - Frames-In
  - Frames-Out
  - Dropped Frames
  - Errors
- Record statistics such as data rate and errors and save the data.
- Perform Trace operations (only under direction of your authorized maintenance provider)
- Read and write memory locations (only under direction of your authorized maintenance provider)
- Update the Flash memory on the selected chassis

- Divide the ports or devices into zones for more efficient and secure communication among functionally grouped nodes. The following zone types are supported:
  - Hard zones
  - Broadcast zones
  - Name server zones
  - Segmented loop zones
- Configure the Mode of each port on the selected chassis. Port Modes include:
  - F_Port (Port forced to be an F_Port)
  - FL_Port (Port allowed to self-configure as a Public Loop port or an F_Port)
  - SL_Port (Port forced to be a Private Segmented Loop port)
  - TL_Port (Port forced to be a Private Translated Loop port)
  - Off Line (Port forced off line)
- View the type of GBIC installed in each port on the selected chassis
- Tune any port on the selected chassis to the multi-frame-sequence (MFS) characteristics of the particular host bus adapter
- View statistics for each port on the selected chassis
- View Address, WWN, FC-4 Type, and Logged-In status of each Loop Device connected to any port on the selected chassis
- Configure the translation entries list for TL_Ports
- Archive all configurable chassis parameters
- Restore all configurable chassis parameters by using the archived configuration

Switch Management Tools

The Switch supports switch management primarily through the following tools. Refer to the *SANbox 8/16 Switch Management User's Manual* for information about these tools.

- SANsurfer switch management application
- A built-in SNMP Agent

SANsurfer Switch Management Application

SANsurfer is the preferred tool for complete fabric monitoring and management offering the following capabilities:

- Establish and configure the switch management interface
- Display switch hardware, firmware, and connection information
- Display port addresses and performance statistics
- Configure and tune ports
- Record performance statistics
- Define hard, Name Server, broadcast, and segmented loop zones
- Configure, archive, and restore chassis parameters
- Configure loop devices and display status information
- Read and write chassis memory
- Update flash memory

Simple Network Management Protocol (SNMP)

SNMP enables you to read management information from the switch.

Fibre Channel Ports

Figure 1-5 identifies the parts of the chassis back. Port numbers are marked on the back of the chassis. Notice that the order of transmit (TX) and receive (RX) connectors on the bottom row of ports is reverse of that on the top row. Also notice that the relative position of the Traffic and Logged-In LEDs is reversed between the bottom and top rows of ports.

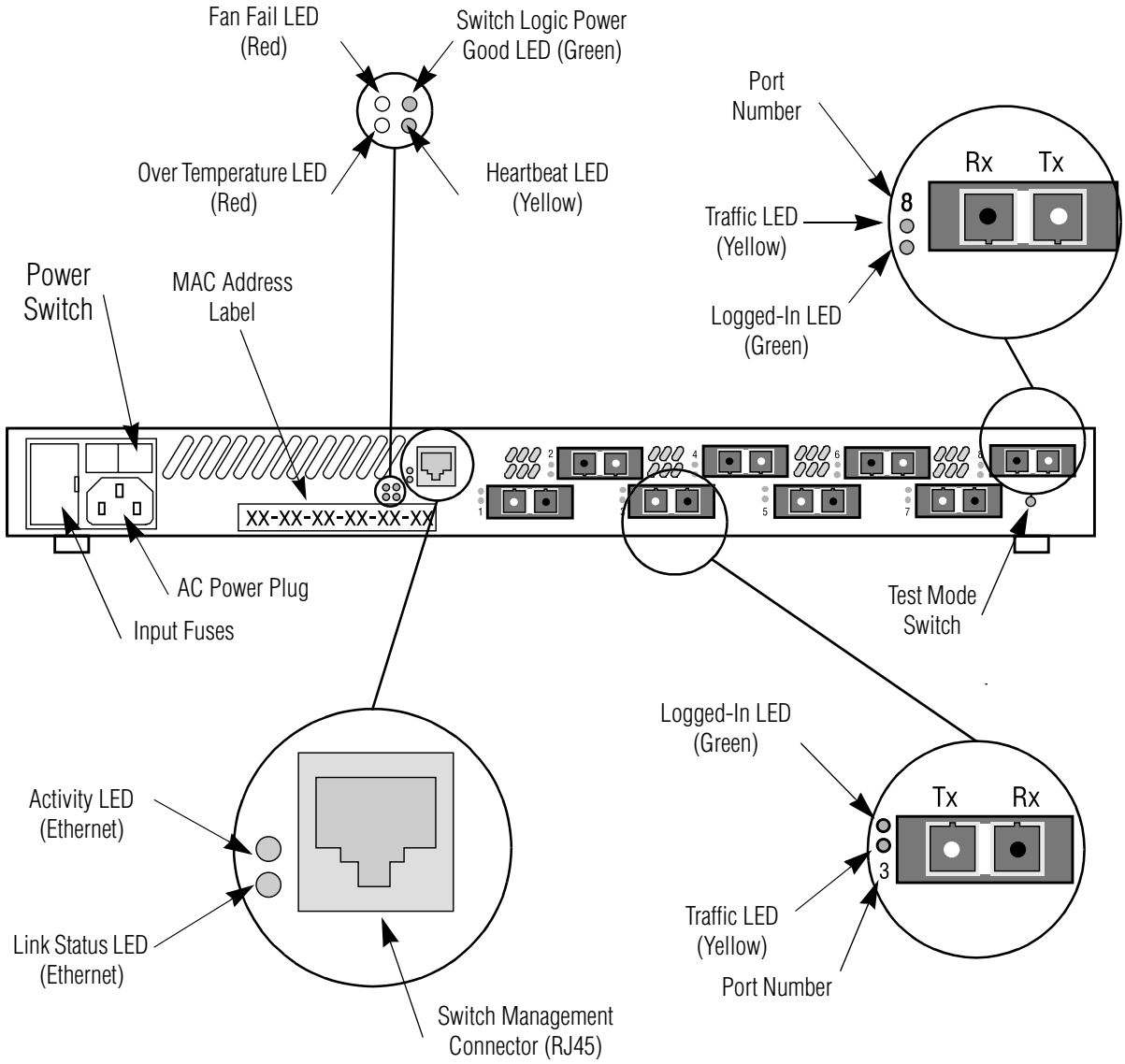


Figure 1-5 Chassis Back

GigaBit Interface Converters (GBICs)

Currently, the following GBICs are certified for use:

- Short-wavelength fiber optic GBICs 100-M5-SN-I or 100-M6-SN-I without OFC to support connection to non-OFC Fibre Channel components.
- Long-wavelength fiber optic GBICs 100-SM-LC-L.
- Copper Inter-Enclosure GBIC (Active) 100-TW-EL-S or 100-TP-EL-S with either DB-9 or HSSDC connectors.
- Copper Inter-Enclosure GBIC (Passive) 100-TW-EL-S or 100-TP-EL-S with either DB-9 or HSSDC connectors.

Certified GBICs may be populated in any combination that suits your use. They are “hot-pluggable” and you may remove or replace them without tools.

Refer to Appendix A Reference Information for certified GBICs and their specifications. Refer also to Section 4 Removal/Replacement Procedures for more information. Figure 1-6 shows a typical GBIC. This one supports fiber optic interconnection media.

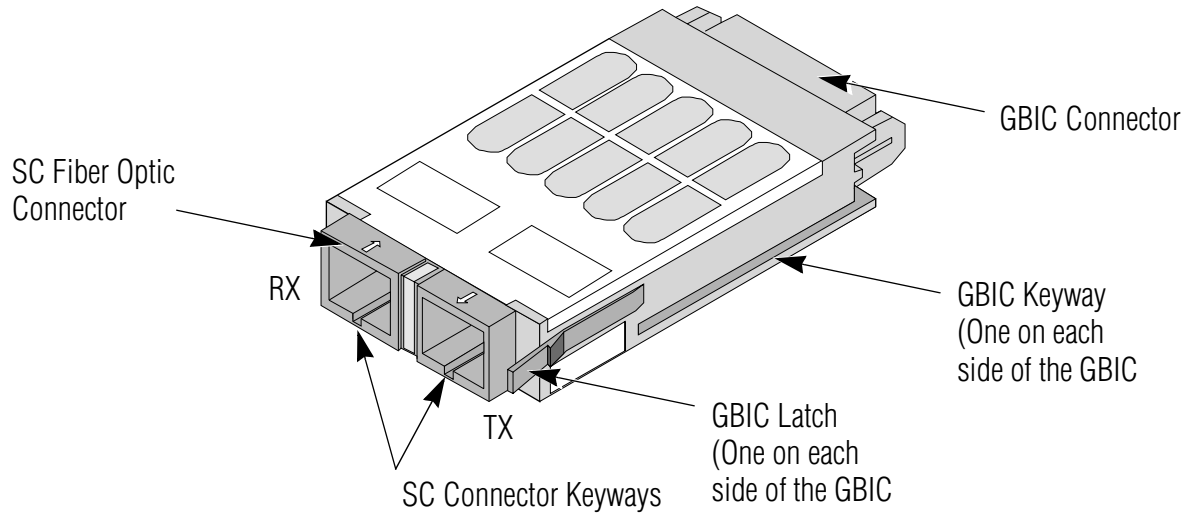


Figure 1-6 Typical GBIC

Back Panel Controls

Power Switch

Figure 1-5 shows the location of the Power Switch. The Power switch is a rocker switch (press the Right side (labeled 1) to turn it ON, press the Left side (labeled 0) to turn it OFF).

When you press the Power switch and turn it ON, there is a two-second delay before the fans start and the Power Good LED on the back of the chassis lights. The Power Good light indicates that the Switch logic is receiving power within the proper voltage range.

Test Mode Switch

The test mode switch is a rotary switch located on the back of the switch chassis as shown in Figure 1-5. The test mode switch enables the switch chassis to perform the following functions:

- Normal Operation: Performs POST diagnostics once at startup then proceeds to normal operation.
- Force PROM: Used to gain access to the PROM when flash memory or the resident configuration file is disabled.

NOTE:
The Test Mode Switch on the back panel is for maintenance purposes only. Refer to "Using the Test Mode Switch" on page 3-4 for more information about how to use the test mode switch.

Back Panel LEDs

Refer to Figure 1-5. LEDs visible through lenses in the back of the chassis indicate chassis and port status. During a Reset operation (for about two seconds at the beginning of power-up) all LEDs are forced ON. The following definitions are valid following the Power-On-Self-Test (POST) when the POST finds no errors. Refer to Section 3 Diagnostics/Troubleshooting for information about how the LEDs act if the POST finds an error or if the control code (located in Flash memory) hangs up.

Heartbeat LED (Yellow)

The Heartbeat LED indicates the status of the internal Switch processor and the results of Power-On-Self-Tests (POSTs) run at power-up.

Following a normal power-up the Heartbeat LED blinks about once per second to indicate that the Switch passed the POSTs and the internal Switch processor is running.

Refer to Section 3 Diagnostics/Troubleshooting for more information about Heartbeat LED error codes.

Switch Logic Power Good LED (Green)

This LED is ON when the Power Supply is delivering power within normal limits to the Switch logic (the Power Switch must be ON).

Fan Fail LED (RED)

This LED is normally OFF. It comes ON only when the speed of a Fan drops below operational level. Refer to Figure 1-5 for the location of the LED. If a fan fails, contact your authorized maintenance provider.

Over Temperature LED (Red)

This LED is normally OFF. The over temperature LED illuminates to indicate that the air temperature inside the switch has exceeded a certain limit. If this LED illuminates, inspect the following:

- Ambient air temperature: maximum 40°C (104°F)
- Proper clearance: 163mm (6.5”) front and back
- Fan operation
- Power supply operation

If the over temperature LED remains illuminated, contact your authorized maintenance provider.

Logged-In LED (Green)

Each port has its own Logged-In LED. The Logged-In LED indicates the logged-in or initialization status of the connected device or loop of devices. A T_Port Logged-In LED will blink to indicate that the switch has been disabled due to a chassis number conflict.

Normal Operation

Initially (immediately after the Switch successfully completes the POST), the Switch holds all Logged-In LEDs OFF (no light). They all remain OFF until the port and its attached devices are able to successfully perform a loop initialization (LIP) or port log-in. Following a successful LIP or log-in on a particular port, the Switch turns the Logged-In LED ON (lit) for that port. This shows that the port is properly connected and able to communicate with its attached device/s. The LED for this port remains ON as long as the port is initialized or logged-in.

If the established/logged-in link is broken (a fiber opens or the connected port goes out of service), the Logged-In LED is shut OFF. If the link is replaced or the connected port comes back into service, the port and its attached device/s will try to regain its initialized or logged-in status. If the initialization/log-in is once again established, the Switch turns the Logged-In LED back ON and communication continues.

It is best to have the Switch operating before the attached nodes are powered up.

Duplicate Chassis Number Warning

Upon T_Port Login, if the fabric senses two switches with the same chassis number, the switch with the higher world wide name will be disabled. In addition, the affected port Logged-In LEDs on both chassis will blink to indicate that a conflict exists.

Traffic LED (Yellow)

Each port has its own port traffic LED. The traffic LED for a particular port is ON when Class 2, or 3 frames are entering or leaving the port. The Switch turns the LED ON for 50 milliseconds for each frame, so you should be able to see it for one frame. This LED will not light for frames following an arbitrated loop in bypass mode.

AC Input Power Connector and Fuses

Refer to Figure 1-5. A standard 3-wire computer-type AC power cable (supplied with the Switch) connects between the AC Input Power Connector and an AC outlet. Refer to "Switch Electrical" on page A-3 for the AC Power Requirements.

An Input Fuse Holder is incorporated into the AC Input Power Connector assembly. It holds two input fuses. Refer to "Input Fuse" on page 4-2 for fuse removal and replacement procedures and to "Switch Electrical" on page A-3 for fuse size.

Switch Management Connector

Refer to Figure 1-5. The Switch Management Connector is a 10/100BASE-T Ethernet interface that provides a connection to a management station. Refer to the *SANbox 8/16 Switch Management User's Manual* for information about how to connect the management station and manage the Switch.

NOTE:
A label on the back of the chassis contains the MAC Address. The MAC Address is used for the physical address for ethernet communication.

Ethernet LEDs

LINK Status

Refer to Figure 1-5. The green LINK Status LED lights only when the Ethernet Interface establishes an electronic link.

Activity

The yellow Activity LED lights when the interface is transmitting data to the network or receiving data from the network.

Section 2 Cabling Devices

This section describes the following factors that affect how you cable devices to the switch:

- Bandwidth
- Device types
- Port types
- Cable types

This section also illustrates several example fabrics.

Bandwidth

Each T_Port link between directly connected chassis contributes 100 megabytes of bandwidth between those chassis. Devoting half of the chassis ports to T_Ports is the recommended limit.

Device Types

There are two types of Fibre Channel devices, Public and Private. Public devices have full Fibre Channel addressing capability and therefore can communicate with any other Public device on the fabric. They may be connected directly to the Switch (one device per port) or arranged in an Arbitrated Loop with up to 126 devices in the loop and the loop connected to the Switch.

Public devices connect to FL_Ports. Each FL_Port is able to discover, through the Fibre Channel Login process, whether it is to function as a Fabric Port (F_Port) or as a Fabric Loop (FL_Port). Most Fibre Channel Adapters in Public devices support both loop and non-loop operation.

Switch management allows you to force any FL_Port to operate in F_Port mode when you connect it to a device that can act in either mode.

For example, one of these devices is a server that can be placed on a loop (port operating in loop mode) or connected directly to the Switch (port operating non loop mode). You may decide to connect it directly to the Switch and force the port to operate in F_Port (non loop mode). It would not be efficient for the Switch port to function as though it was connected to a device on a loop. So, use Switch Management to force the Switch port to function as an F_Port.

Another example is connecting a RAID to the Switch. The RAID is also a device that is capable of operating on a loop or connected directly to the Switch. If this

device is connected directly to the Switch it may be more efficient to force the Switch port to function as an F_Port.

If the attached devices really are arranged in a loop (a Hub or JBOD for example) with no controller, allow the Switch port to function as an FL_Port.

Private devices do not have full Fibre Channel addressing capability. They only have the Arbitrated Loop Physical Address (ALPA) portion of the Fibre Channel Physical Address. These devices only exist on loops and unless the Switch offers extra support, these devices cannot communicate outside their own loop.

Private devices connect to Segmented Loop Ports (SL_Ports) or Translated Loop Ports (TL_Ports). You must use Switch Management to configure any or all ports to SL or TL_Ports. Refer to "Major Fibre Channel Port Features" on page 1-2 for a description if SL and TL_Ports. Use Switch Management to configure SL and TL_Ports.

You may place a Private device on a Public loop but the Private device will not be able to communicate outside the loop. You may place a Public device on a Private loop but the Public device functions as a Private device.

Port Types

Any Fibre Channel port may be an FL_Port, F_Port, SL_Port, TL_Port, or a T_Port. The type of media used (fiber optic cable or copper) depends on the type of Fibre Channel adapter in the attached device and the type of GBICs used in the Switch. Populate the Switch with any assortment of GBICS approved for your interconnection media type.

Port Groups and Latency Considerations

You can optimize the system performance by connecting devices which have the greatest amount of traffic to ports on the Switch which are most efficiently inter-connected.The most efficient performance is within a group of four ports on the same Application Specific Integrated Circuit (ASIC). These groups are:

- Ports 1-4
- Ports 5-8

When a frame source-port and destination-port are within the same port group, you will realize:

- The lowest Class 2/Class 3 frame latency
- The highest Class 2/Class 3 point-to-point bandwidth
- The highest Class 2/Class 3 aggregate bandwidth

Cable Types

The type of cable you use will depend on the distance between each adapter and the Switch. For distances up to 33 meters, copper cable is sufficient. For distances greater than 33 meters up to 20 kilometers, fiber optic cable is required. Use the type of cable that meets the need; fiber optic cable has greater range, but copper cable is less expensive. Choose GBICs that are compatible with the cable type, distance, Fibre Channel revision level, and the device host bus adapter., and the type of GBICs and the type of cable installed. Cable can be fiber optic or copper.

Keys on “Duplex” cable assemblies (a connector-pair containing both transmit and receive fastened together in one unit), prevent you from connecting them incorrectly. On the Switch end of the connection, on the top row of ports, the transmit connector is the right-hand connector of each pair. On the bottom row of ports, the transmit connector is the left-hand connector of each pair.

On the device end, you will have to consult the appropriate adapter or device manual to determine the connector orientation.

Fabric Examples

Figures 2-1 through 2-4 are examples of device connections to a single chassis switch. The same concepts apply to fabrics containing multiple chassis.

Public Loop Storage Devices Connected to Public Servers

Figure 2-1 shows Public Loop storage devices connected to FL_Ports. The servers may be able to attach to either F or FL_Ports. If this is the case, use Switch Management to force the FL_Ports to function as F_Ports. If the servers will only attach to F_Ports, the ports will "self discover and function as F_Ports.

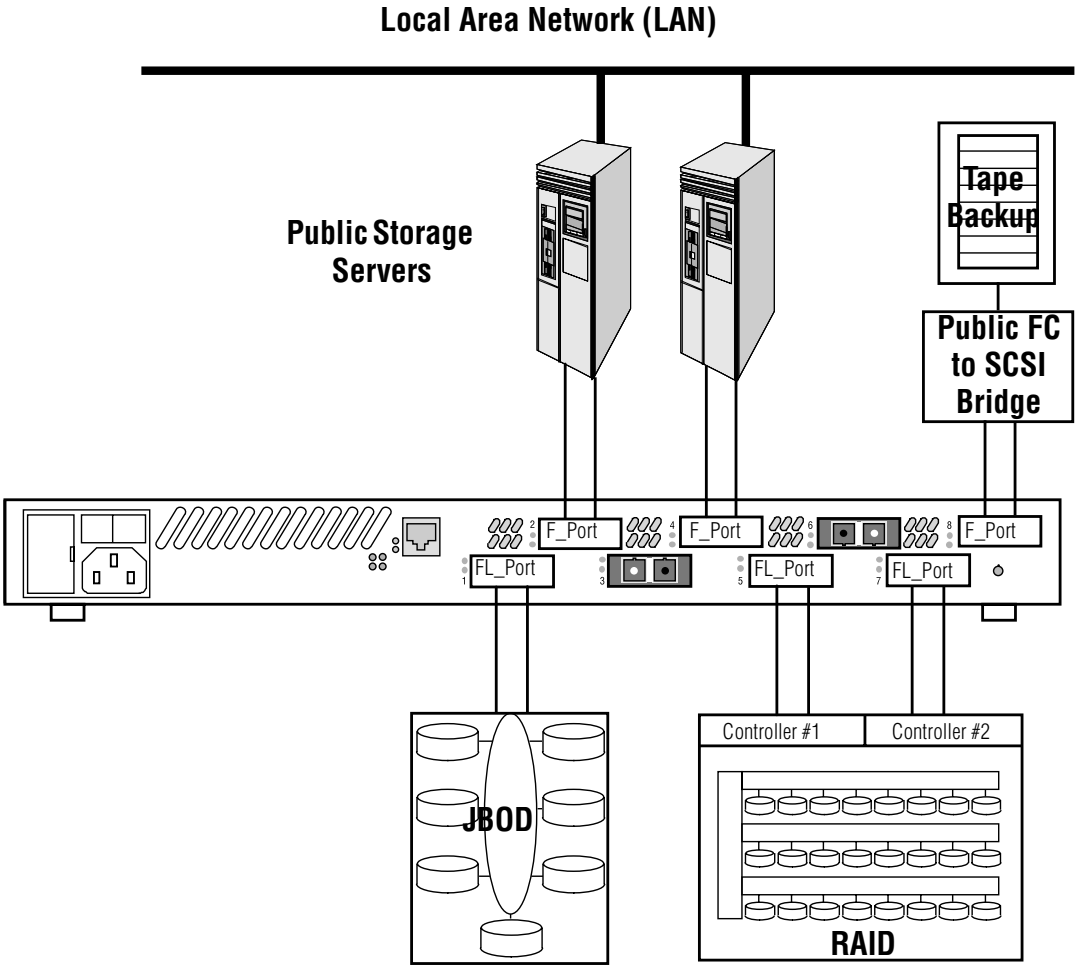


Figure 2-1 Public Loop Storage Connections

Variety of Public Device Connections

Figure 2-2 shows a variety of Public device connections.

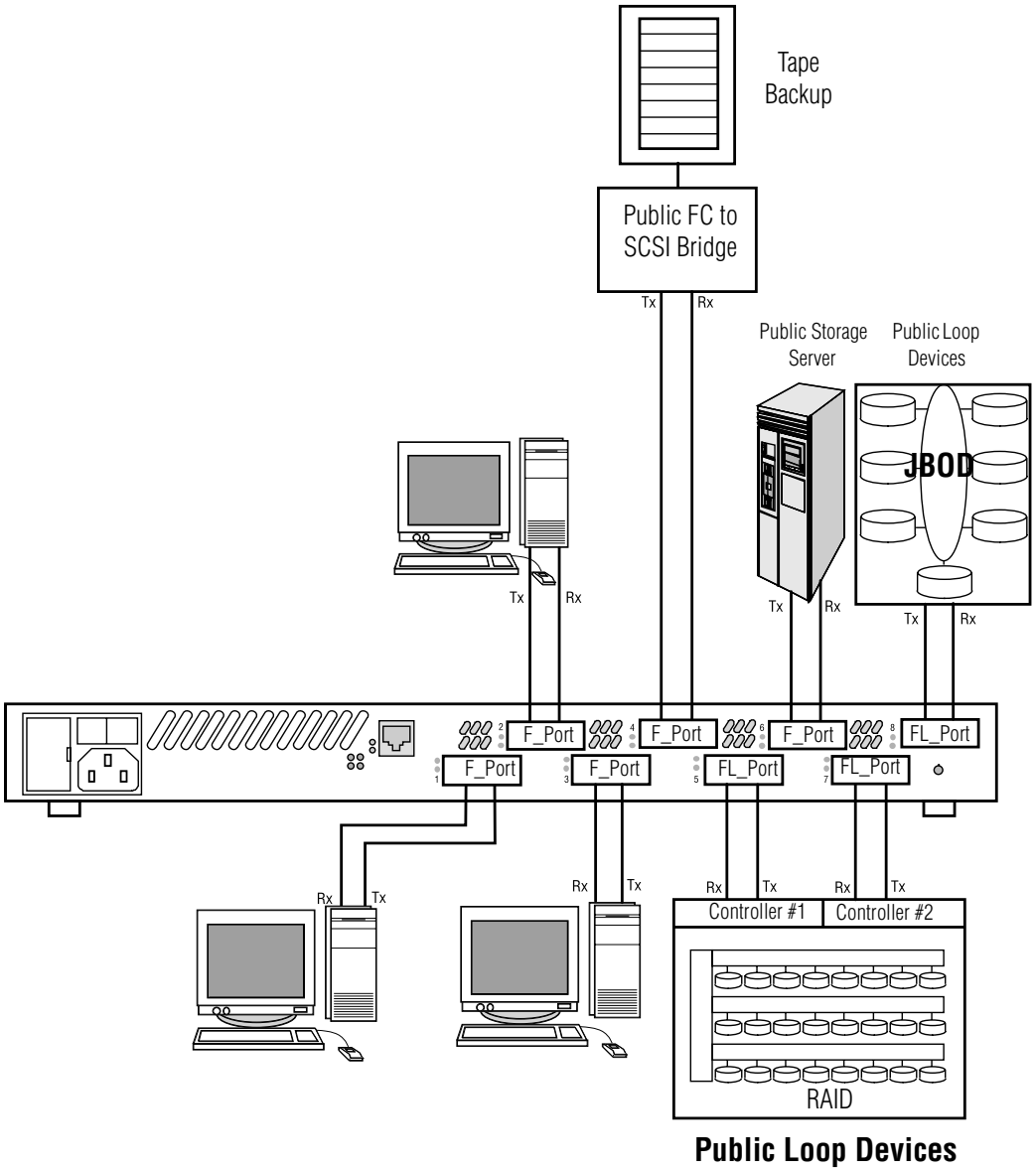


Figure 2-2 Public Device Connections

Private Segmented Loop Connections

Figure 2-3 shows the connection of Private Loop servers and Private Loop storage units. Each SL_Port is one segment of a segmented loop. Each segmented loop may be divided into a maximum of 33 segments. Use Switch management to configure the appropriate ports to SL mode and to link SL_Ports (segments) into segmented loops. For example you could have Server 1 and the RAID on one segmented loop and the remainder of the servers and the JBODs on another segmented loop. Remember that these private devices cannot communicate between private loops through the Switch, only within their segmented loop.

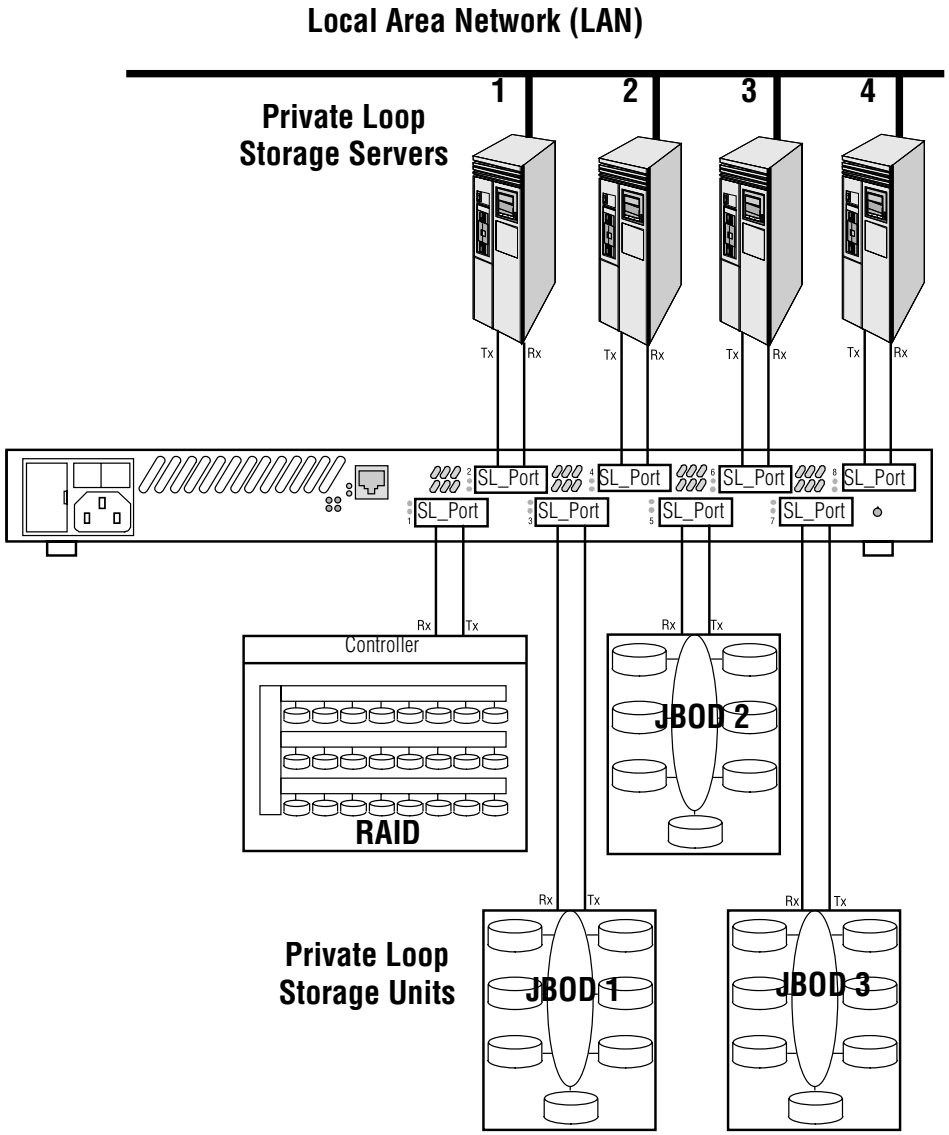


Figure 2-3 Private Segmented Loop Connections

Private Translated Loop Connections

Figure 2-4 is an example of Translated Loop ports (TL_Ports) used in conjunction with each other and with F and FL_Ports. Use Switch management to configure the appropriate TL_Ports and to identify the “off loop” initiators and targets for devices on each TL_Port.

Note in Figure 2-4 that Public Server 1 is an initiator for RAID 1 on Private Loop 1. Private Server 2 is an initiator for RAID 2 on the Public Storage Loop.

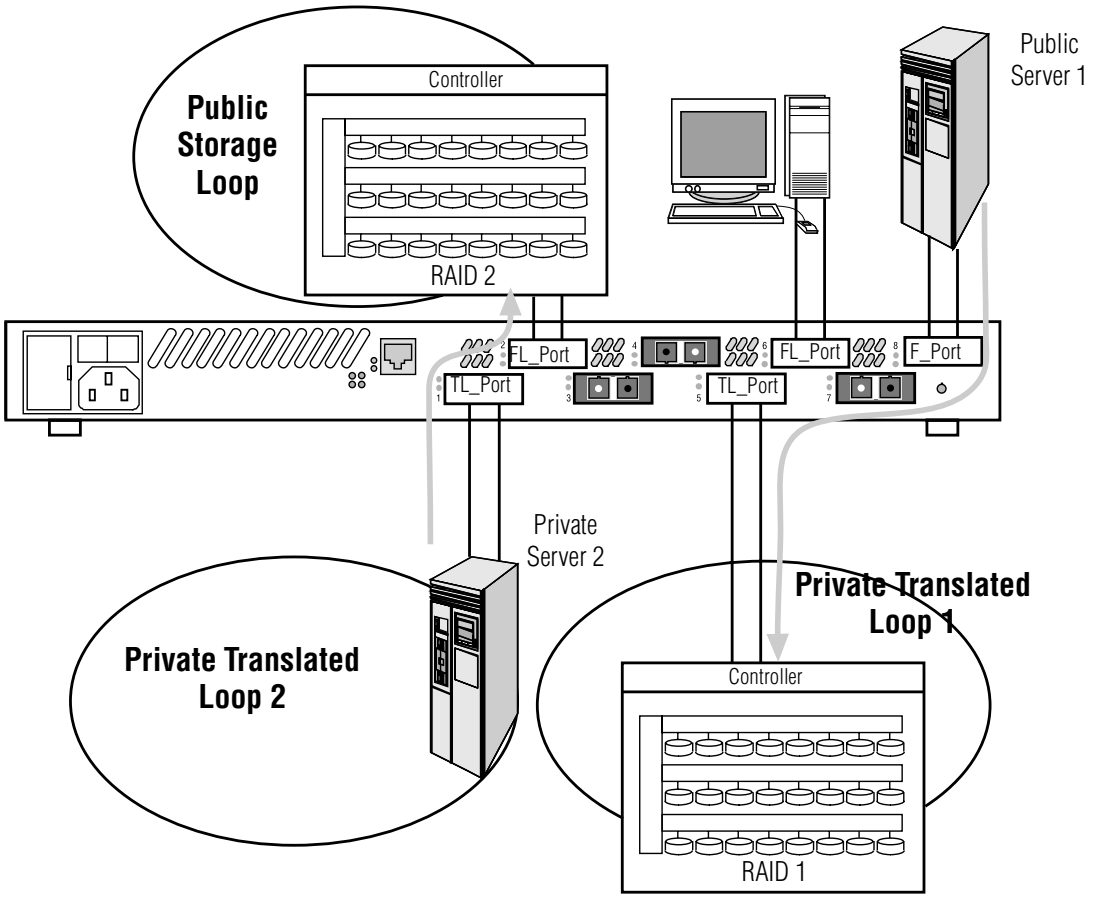


Figure 2-4 Private Translated Loop Connections

Notes

Section 3 Diagnostics/Troubleshooting

Introduction

Section 3 contains information to help you diagnose and troubleshoot problems with your Switch.

- Power Supply Troubleshooting helps you solve AC power and Power Supply problems.
- Power-On-Self-Test (POST) checks the condition of the Switch with the exception of the GBICs.
- Fiber Continuity tests for open fibers in the cable network.

Power Supply Troubleshooting

The following procedure assumes that the Power Good LED does not light.

Check the following conditions:

- the AC power outlet has the proper voltage
- the Power Cable has continuity and is plugged into both the AC power outlet and the Switch chassis
- the Input Fuses are good (Refer to Section 4 Removal/Replacement Procedures)
- The Power Switch is in the ON (1) position

Correct the problem.

If the above steps do not lead you to the problem, contact your authorized maintenance provider.

Power-On-Self-Test (POST)

Overview

The Switch checks the state of the Test Mode switch as part of its power-up procedure. Refer to Figure 3-5 for the location of the Test Mode switch.

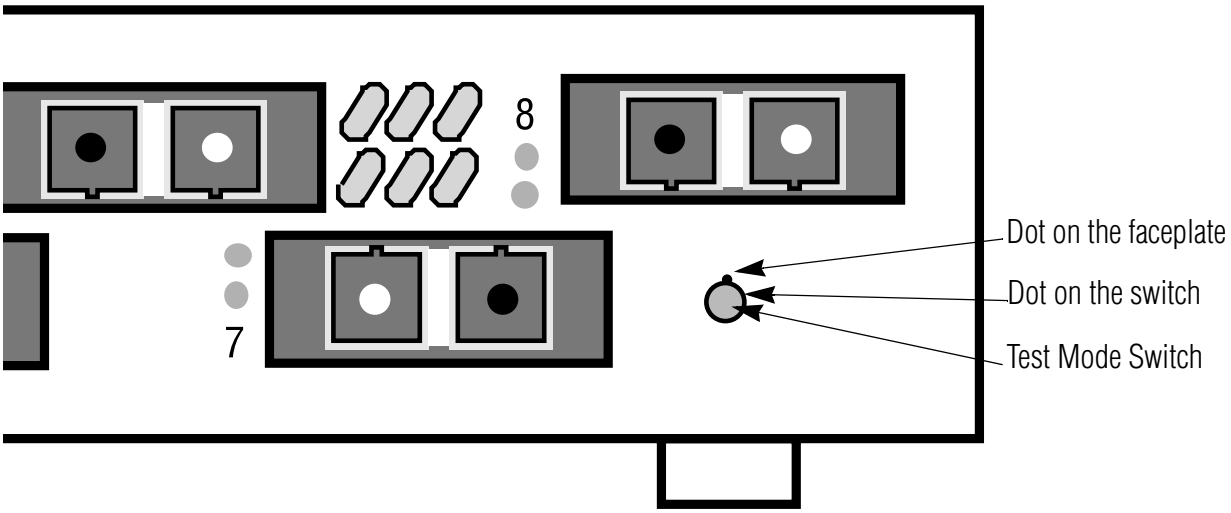


Figure 3-5 Test Mode Switch

The normal setting of this switch (note the location of the dot on the switch relative to the dot on the faceplate) instructs the Switch to run the diagnostics one time at startup. If no fatal errors are encountered, the Switch places itself in normal operating mode. The diagnostics run at startup are the Power-On-Self-Test (POST) diagnostics.

These POST diagnostics check for proper Switch operation except for the GBICs. During the POST, the Switch logs any errors encountered. Some POST errors are fatal, others are non-fatal. A fatal error disables the switch so that it will not operate. A non-fatal error allows the switch to operate, but with some decrease in performance until the problem can be corrected.

For example:

- A PROM checksum failure is an example of a fatal error. This indicates that the PROM firmware is corrupt and the switch will not operate.
- A failure associated with a Fibre Channel port is an example of a non-fatal error. The Switch can isolate the bad port while the other ports continue to operate.

NOTE:
In the following POST error descriptions, you will note that some errors result in a Switch that is operable, but in a degraded way (non-fatal errors), other errors result in a Switch that is not operable (fatal errors).Whether the problem is fatal or non-fatal, please contact your authorized maintenance provider. If the problem is non-fatal, you should be able to run in a degraded mode until the problem is fixed.

When POST is complete and errors are encountered, the Switch uses the Heartbeat LED to blink an error code which describes the first fatal error encountered. These error codes are described next in this section. The Switch then reads its error log and if it has encountered non-fatal errors that affect one or more ports (but the remaining ports are operable) it will disable the bad ports and blink the Logged-in LED of the affected port or ports to indicate which ports are down. If the error is non-fatal but does not affect a single port or group of ports, only the Heartbeat LED blinks an error code. In all cases, the Switch displays the POST error indications until you power it down.

For example:

- If the POST encounters a PROM Checksum error, the entire Switch is inoperable. The Heartbeat LED will blink the error code for the fatal PROM Checksum error. The entire Switch is down and no port Logged-in LEDs are lit because the problem does not affect an individual port or ports.
- If the POST encounters a Bus error, the Switch may operate in a degraded mode because it has multiple Buses. It can operate with one or more of them in operation but some normal processing functions such as in-order delivery may be adversely affected. The Heartbeat will blink the error code for the non-fatal Bus error. The Switch may operate (a little slower) and no port Logged-in LEDs are lit because the problem does not affect the ports.
- If the POST encounters a Port error, the Switch may operate with the remaining Ports. The Heartbeat blinks an error code for the non-fatal Port error. The Switch disables the failing port or ports and blinks their Logged-in LEDs.

The POST diagnostic program performs the following basic tests:

- checksum tests on the Boot firmware located in a PROM and the main Switch firmware located in FLASH memory
- functional hardware tests on internal Switch memory
- various read/write register and loopback data-path tests on the Switch logic
- Frame Bus and Auto Route logic tests

- Switch Management port logic
- Arbitrated Loop tests

Using the Test Mode Switch

The test mode switch is a small rotary switch located on the back of the switch chassis as shown in Figure 1-5. The test mode switch enables the switch chassis to perform the following functions:

- Normal Operation: Performs POST diagnostics once at startup then proceeds to normal operation.
- Force PROM: Used to gain access to the PROM when flash memory or the resident configuration file is disabled.

The test mode switch position determines which of these functions are performed when the switch chassis is powered up. The positions and their functions are shown in Figure 3-5. Normal operation is indicated by the alignment of the small notch on the test mode switch with the dot on the faceplate.

NOTE:
The Test Mode Switch on the back panel is for maintenance purposes only. Data could be corrupted if the test mode switch is used while the switch chassis is in operation.

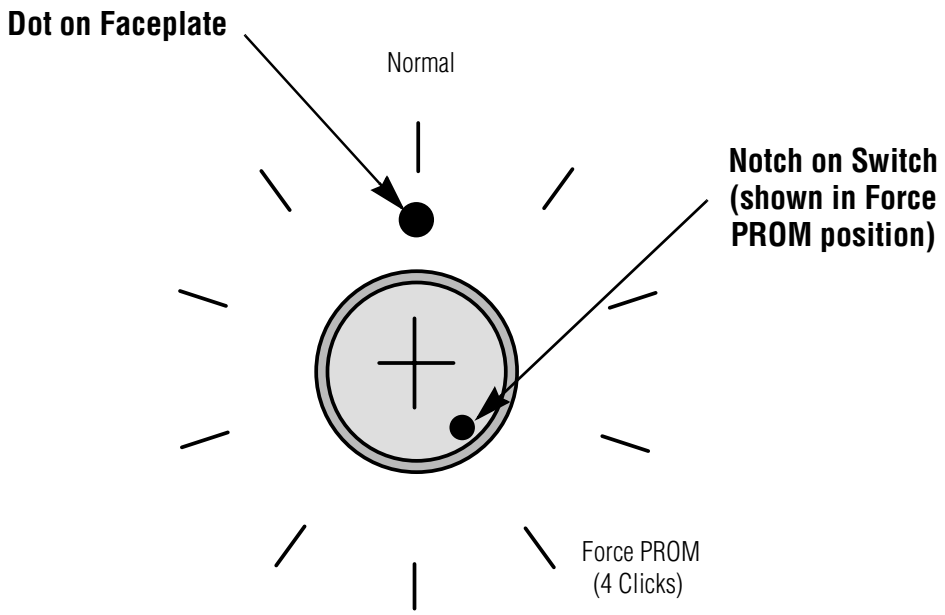


Figure 3-6 Test Mode Switch Functions and Positions

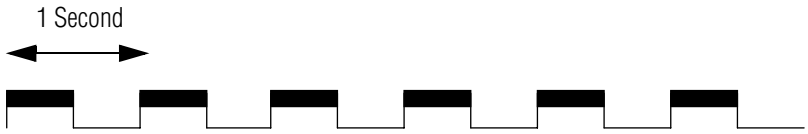
Use a small screwdriver to change test mode switch positions. Use the normal position as a reference and count the number of clicks (1 click per position). These clicks are not audible and are best detected by feel.

1. Isolate the switch chassis from the fabric. Data could be lost or corrupted if the test mode switch is used while data is being transmitted.
2. Using a small screwdriver, rotate the test mode switch to the desired position.
3. Turn the power switch off, and then back on to reset the switch chassis.
4. Observe the heartbeat LED for error codes (5 blinks is normal when in Force PROM mode). Correct conditions or reconfigure the switch as needed.
5. Return the test mode switch to the normal position, aligning the small notch with the dot on the faceplate.
6. Turn the power switch off, and then back on to reset the switch chassis.

Heartbeat LED Blink Patterns

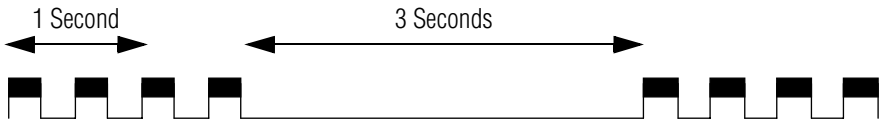
Normal (all pass)

If all POST diagnostics pass, the Switch will go to normal operation and the Heartbeat LED will blink at a steady rate of one (1) blink per second.



Failure Blink Patterns

The Heartbeat LED indicates the error by blinking a series of blinks, pausing for three seconds, then repeating the blinks. The number of blinks between the three-second pauses indicates the error. The blinks are at about twice the speed of the normal Heartbeat.



Test/Failure Descriptions

The following paragraphs describe the tests and their failure indication.

If any POST errors occur, notify your authorized maintenance provider.

PROM Checksum Failure (1 Blink)

The Switch is not operable. This is a checksum test of the PROM designed to verify the integrity of the PROM data. A failure indicates the PROM data is corrupted and blinks the Heartbeat LED once between three-second pauses. No port Logged-in LEDs blink.

RAM Failure (2 Blinks)

The Switch is not operable. This is a test designed to verify the data and address busses to the SRAM as well as the SRAM integrity. A failure indicates that either the data bus, address bus, or SRAM is failing and blinks the Heartbeat LED twice between three-second pauses. No port Logged-in LEDs blink.

Flash Checksum Failure/Switch Management Port (Ethernet) Tests Good (3 Blinks)

The Switch is not operable. The Flash checksum test verifies the integrity of the Flash data. If the Flash data is corrupt, the POST next checks the Switch Management port to find out if it is functional. It does this because the Switch Management port is the load path for loading new Flash data. If the Switch Management port tests good, the Switch blinks the Heartbeat LED three times between three-second pauses. No port Logged-in LEDs blink. This means that you may load new Flash control code via the Switch Management port. Refer to the *SANbox 8/16 Switch Management User's Manual* for a description of how to load new Flash code.

Flash Checksum Failure/ Switch Management port (Ethernet) Failure (4 Blinks)

The Switch is not operable. The Flash checksum test verifies the integrity of the Flash data. If the Flash data is corrupt the POST next checks the Switch Management port to find out if it is functional. It does this because the Switch Management port is the load path for loading new Flash data. If the Switch Management port tests bad, the Switch blinks the Heartbeat LED four times between three-second pauses. No port Logged-in LEDs blink. This means that the Flash control code is corrupt and the Switch Management port may not operate well enough to load new Flash code.

Force PROM Mode in Effect (5 Blinks)

This is an alarm. This indicates that the processor is reading the default configuration from PROM instead of from Flash memory. This is due to the Test Mode Switch being in the Force PROM position. You should never see this error in the field as long as the Test Mode switch is in the proper position. The Heartbeat LED will blink five times between three-second pauses.

Switch ASIC Test Failure (6 Blinks)

The Switch is not operable. The Switch ASIC Test verifies the base functionality of each Switch ASIC. This includes the control port interface and all functions that can be performed within the confines of an individual ASIC. A failure indicates a faulty Switch ASIC and blinks the Heartbeat LED six times between three-second pauses. The Switch disables the ports associated with the bad ASIC and blinks their Logged-in LEDs. An ASIC that fails this test could affect the operation of the remaining ports.

GBIC Bypass Port Loopback Test Failure (7 Blinks)

The Switch is operable. The GBIC Bypass Port Loop-Back Test verifies (on a port-by-port basis) the ability of each Switch ASIC to loop data out through the Serdes chip on a port and back to the ASIC control port (bypassing the GBIC). A failure indicates either a faulty Switch ASIC or an ASIC to Serdes interface problem and blinks the Heartbeat LED seven times between three-second pauses. The Switch disables the failing port or ports and blinks their Logged-in LEDs. The ports whose Logged-in LEDs are not blinking have passed the test and are all usable.

Fibre Channel Port Loop-back Test Failure (8 Blinks)

This test runs in Continuous Test only. Continuous Test is controlled by the Test Mode switch. Use this test only under the direction of your authorized maintenance provider. They will tell you how to activate this test.

The Switch is not operable while in Continuous Test. In Continuous Test mode, the Switch Fibre Channel Port Loop-Back Test verifies the ability of each Switch ASIC to loop data out through each Fibre Channel port, through a loopback plug, and back to the ASIC control port. In order to accomplish this test, you must attach a loop-back plug to each GBIC as you test it. One loopback plug comes with each GBIC type that you ordered. Therefore you will be able to test the GBICs one at a time.

To test:

1. Place the chassis into Continuous Test.
2. Remove all GBICS from the chassis except the one you want to test. The GBIC under test may be in any port. The Continuous Test will skip all empty ports.
3. Insert a loopback plug into the GBIC.
4. Cycle the chassis power to cause a reset.

5. After a few seconds of testing, if the Heartbeat LED is blinking the normal “heartbeat” (about once per second), the GBIC passes the test. If the Heartbeat LED blinks the 8-blink error code, the GBIC failed.

   Repeat steps 2 through 5 to test all GBICs one at a time.

6. When all tests are complete, place the Test Mode Switch back in the “Normal Run” position (small dot on the end of the shaft pointing straight up).

7. Cycle the chassis power to cause a reset.

Switch Bus Test Failure (9 Blinks)

The Switch may be operable. The Switch Bus Test verifies the ability of the Switch ASICs to communicate to each other via the busses that interconnect the ASICs. A failure indicates an inability of an ASIC pair to communicate over one or more busses. The Switch is operable as long as at least one Frame Bus is operable. However, some normal processing functions such as in-order delivery may be adversely affected. A failure blinks the Heartbeat LED nine times between three-second pauses. No port Logged-in LEDs blink.

Switch Auto-Route Test Failure (10 Blinks)

The Switch is operable. The Switch Auto-Route Test verifies the auto-route capability of individual ports to automatically route frames to the other ports in the chassis. A failure indicates an inability to successfully route frames between a port pair and blinks the Heartbeat LED ten times between three-second pauses. The Switch disables the failing ports or port-pairs and blinks their Logged-in LEDs.

The ports whose Logged-in LEDs are not blinking have passed the test and are all usable.

11 Blinks— Not used.

12 Blinks — Not used.

Arbitrated Loop Test Failure (13 Blinks)

The Switch is operable. The Arbitrated Loop test verifies the ability of the Arbitrated Loop ports to initialize properly. A failure indicates the inability to successfully initialize an Arbitrated Loop (FL) port and blinks the heartbeat LED 13 times between three-second pauses. The Switch disables the failing ports and blinks their Logged-in LEDs.

The ports whose Logged-in LEDs are not blinking have passed the test and are all usable.

Switch Management Port Failure (14 Blinks)

The Switch is operable. The Switch Management Port test verifies the integrity of the Ethernet data bus functionality. A failure indicates that communication over the Ethernet port will most likely be adversely affected when this failure is indicated. The Heartbeat LED will blink fourteen times between three-second pauses. No port Logged-in LEDs blink.

The remainder of the Switch and all ports have passed the tests and are operable.

NVRAM Test Failure (15 Blinks)

The Switch is not operable. The Non-Volatile Memory (NVRAM) test verifies the status of the NVRAM battery (not low), performs a checksum on any existing data, and performs a data write/read test on the unused areas of the NVRAM. A test failure in any of the above three tests will blink the Heartbeat LED 15 times between three-second pauses.

Hung Flash Control Code

The Switch is not operable. If the Power Good LED is lit and the Heartbeat LED and the remaining back-panel LEDs all blink in unison, the Flash control code running the processor is hung.

Complete Failure

The Switch is not operable. If the Power Good LED is lit and the Heartbeat LED does not blink at all (always ON or always OFF) the Switch is not operable.

Cable Continuity Tests

When there is a problem communicating over a particular link and both the switch and the connected device pass their respective tests, check the continuity of the cables. If possible, swap another set of cables into the faulty link. If the problem remains, contact your authorized maintenance provider.

Within the SANsurfer switch management application, the Port Display provides a means of testing the port and its connections. Refer to the *SANbox 8/16 Switch Management User's Manual* for information about testing ports, port test parameters, and the Start Tests button.

Notes

Section 4 Removal/Replacement Procedures

Introduction

Input Fuses and GBICs and are easily replaceable at the user's site. The Fans, Power Supply, and the Battery are also replaceable, but these require the removal of the chassis top.

DANGER:
QLogic recommends that any FRUs that require removal of the chassis top (to access the FRUs inside) be done at a repair depot. Removal of the chassis top may expose the service person to a voltage hazard and the Switch module to damage by static discharge. Please read the Danger, Warning, and Caution notices in this section.

GEFAHR:
QLogic empfiehlt, daß alle FRUs, die ein Entfernen des Gehäuseaufsatzes erfordern (um Zugang zu den FRUs zu erhalten) in einer Reparaturwerkstatt ausgetauscht werden. Wenn der Gehäuseaufsatz entfernt wird, wird der Wartungstechniker möglicherweise gefährlichen Spannungen ausgesetzt und das Schaltermodul durch statische Entladung beschädigt. Bitte die Gefahren-, Warn- und Vorsichtshinweise in diesem Abschnitt lesen.

DANGER:
QLogic recommande que le remplacement de toutes pièces FRU qui exigent le retrait du dessus du châssis (pour accéder aux FRU se trouvant à l'intérieur) soit effectué au dépôt des réparations. Le retrait du dessus du châssis risque d'exposer la personne d'entretien à de la tension et le module commutateur à un endommagement par décharge électrostatique. Prière de lire les notes informatives Danger, Avertissement et Attention contenues dans cette section.

Input Fuse

Removal

1. Press the Power Switch to the OFF (0) position.
2. Unplug the AC Power Cable from the back of the Switch chassis.
3. Refer to Figure 4-1. Insert a thin-blade screwdriver into the slot behind the tab and twist it to pull the Fuse Holder out the AC Power Plug Assembly.
4. Lift the latch on the Fuse Holder until you can withdraw the Fuse Board.
5. Pull the Fuse(s) from the Fuse Board.

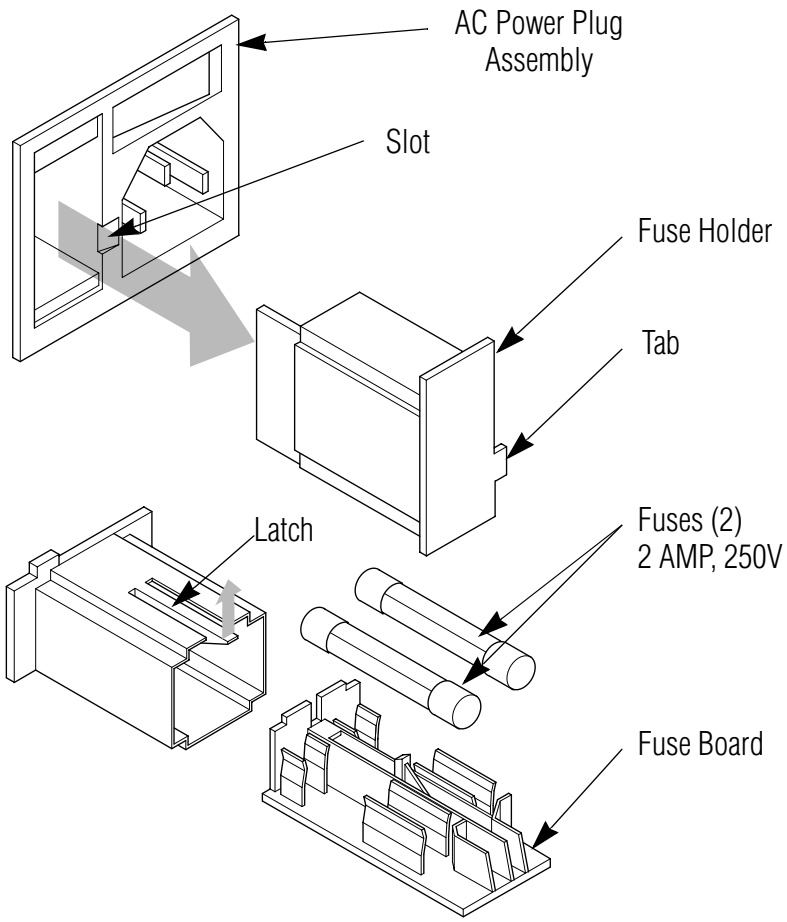


Figure 4-1 Removing the Input Fuse

Replacement

1. Insert the Fuse(s) into the Fuse Board. Refer to Appendix A Reference Information for fuse-type information.
2. Insert the Fuse Board into the Fuse holder and press it in until it clicks past the Latch.
3. Insert the Fuse Holder into the AC Power Plug Assembly and press it in until it is flush with the surface of the assembly.
4. Plug the AC Power Cable into the AC Power Plug Assembly.
5. Press the Power Switch to the ON (1) position.

GBIC

GBICs may be removed and replaced with the Switch power on without disrupting traffic on other ports.

Removal

1. Disconnect the cable (if one is connected) from the GBIC you are removing.
2. Remove GBICs. Some GBICs have individual latches; others are operated by a built-in bail. To remove GBICs that have individually operated latches, as shown in Figure 4-2, do the following:
   a. Using the thumb and forefinger of one hand, grasp the GBIC and press both latches toward the center of the GBIC.
   b. While squeezing, withdraw the GBIC from the chassis. When the GBIC is withdrawn, a spring-loaded door will close the port opening.

NOTE:
The force required to overcome the friction of the pins in the GBIC connector and withdraw it from the chassis may be more than you can exert without your fingers slipping off the latches. If you have trouble, try a piece of double-backed tape under your thumb and forefinger to get a better grip on the GBIC. Do not use pliers or similar tools. You may damage the GBIC.

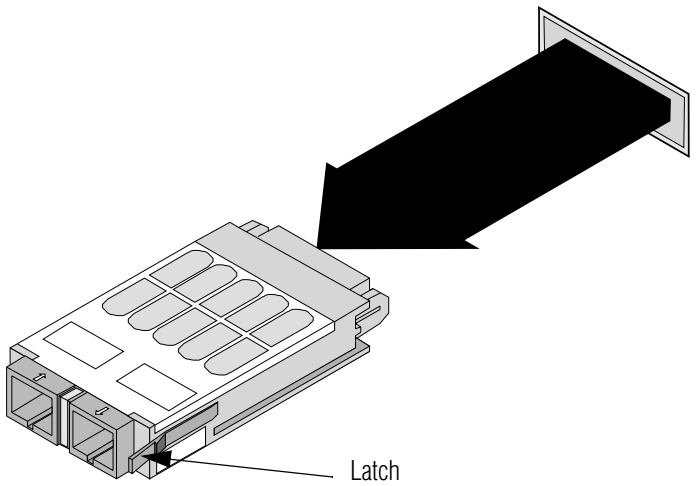


Figure 4-2 Removing GBICs that have individually operated latches

To remove GBICs that have bail-operated latches, as shown in Figure 4-3, use your finger-tip to rotate the bail outward, then pull on the bail to remove the GBIC.

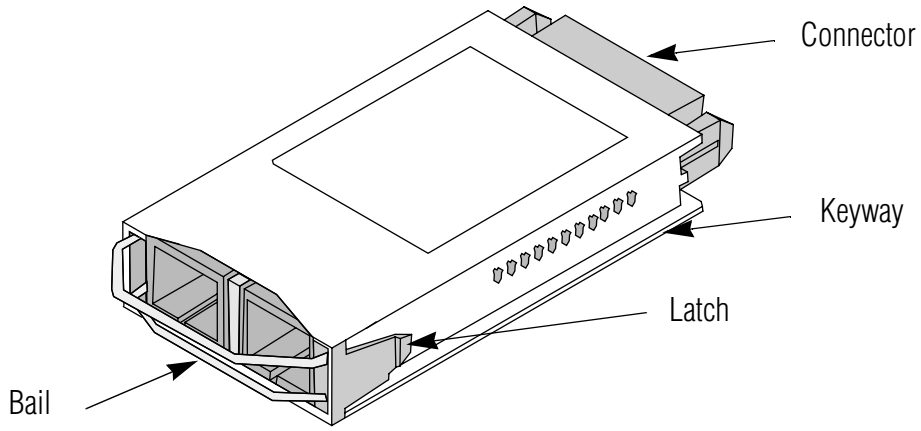


Figure 4-3 Removing GBICs that have bail-operated latches

Replacement

GBICs may be removed and replaced with the Switch power on without disrupting traffic on other ports.

1. Orient the GBIC as shown in Figure 4-4. The Keyway is on the bottom (as shown) for the top row of ports and on the top for the bottom row of ports.

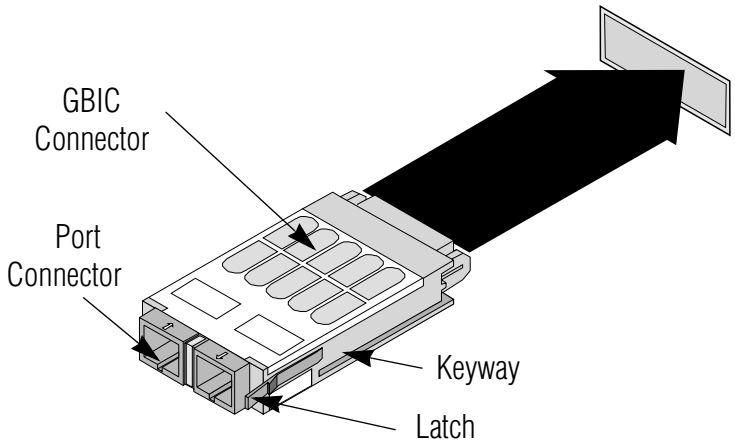


Figure 4-4 Replacing GBICs

2. Slide the GBIC into the port opening (the spring-loaded door will open as you push the GBIC in). If you can only slide the GBIC in about an inch (2.5 cm) before it stops, you have the Keyway in the wrong position; flip the GBIC over and try it again.
3. Push the GBIC in until the GBIC Latches snap into place. If you have a GBIC that has bail-operated latches, make sure that the bail is rotated to the latched position. This allows the latches to latch (refer to Figure 4-3).
4. Cable the port.

Battery (Repair Depot Only)

The battery powers non-volatile memory used to store the Switch configuration. The battery has a service life of 10 years.

CAUTION:
The Switch module inside the chassis is sensitive to static discharge. Avoid touching this module except to perform the particular Removal/Replacement Procedure and wear a properly grounded wrist strap. QLogic provides a wrist strap with each FRU that resides inside the chassis.

VORSICHT:
Das Schaltermodul im Gehäuse ist gegenüber statischer Entladung empfindlich. Das Modul nur berühren, wenn ein spezifisches Ausbau-/Austauschverfahren durchgeführt und ein Antistatik-Erdungsband um das Handgelenk getragen wird. Für jedes im Gehäuse befindliche FRU stellt QLogic ein Antistatik-Erdungsband bereit.

ATTENTION:
Le module commutateur à l'intérieur du châssis est sensible aux décharges électrostatiques. Éviter de toucher ce module sauf pour entreprendre la procédure particulière de retrait/remplacement, et porter une dragonne correctement mise à la terre. QLogic fournit une dragonne avec chaque FRU qui réside à l'intérieur du châssis.

Appendix A Reference Information

This appendix contains the specifications for the SANbox-8 Switch. Refer to "Fibre Channel Ports" on page 1-13 for the location of all connections, switches, and components.

SANbox-8 Switch Specifications

Switch

Fibre Channel Protocols:	FC-PH Rev. 4.3 FC-PH-2 Rev. 7.4 FC-PH-3 Rev. 9.4 FC-AL Rev. 4.5 FC-AL-2 Rev. 7.0 FC-FLA Rev. 2.7 FC-GS-2 Rev. 5.3 FC-PLDA Rev. 2.1 FC-SW Rev. 3.3
Fibre Channel Classes of Service:	Class 3, Class 2
System Architecture:	Connectionless Fibre Channel fabric
Modes of Operation:	Connectionless only:Class 2 and/or Class 3
Fabric Port Types:	F_Ports, FL_Ports, SL_Ports, TL_Ports, T_Ports All Switch ports can be any of the above ports.
Number of Fibre Channel Ports:	8 Ports per chassis; Populated by 2 to 8 GBICs in one GBIC increments.
Buffer Credits	Each port has eight buffer credits. This allows a cable length up to 13 km at 1 Gbps without performance degradation. Cable length is also dependant on the type of GBIC used.

Media Type: .....Industry standard Gigabit Interface Converter (GBIC).
Hot pluggable.
Media supported by the Standard:
Shortwave 100-M5-SN-I
Longwave 100-SM-LC-L
Copper Inter-Enclosure (HSSDC or DB-9)
Active 100-TW-EL-S
Active 100-TP-EL-S
Copper Intra-Enclosure (HSSDC or DB-9)
Passive 100-TW-EL-S
Passive 100-TP-EL-S
Any type in any fabric port.

Media Transmission Ranges: .....See GBIC specifications on pages A-5 through A-6.

Fabric Port Speed: .....1.0625 Gb/second

Fabric Latency (best case): .....Class 2 or Class 3 frame: <0.6 µsec.

Fabric Point-to-Point Bandwidth: .....Class 2 or Class 3: 101.8 MB/s

Fabric Aggregate Bandwidth: .....(Single Stage only)
Class 2 or Class 3: Up to 8 Gb/s

Maximum Frame Sizes: .....2148 bytes (2112-byte payload)

System Processor: .....Superscalar 33-MHz Intel i960HA

Switch Maintainability

Maintenance Strategy: .....FRU-based:
GBIC Modules
AC input fuses
Two Chassis Fans
Power Supply
Battery
Does not require system interruption for:
GBIC insertion to populate/activate new ports GBIC replacement

Diagnostics: .....Power-On-Self-Test (POST) tests all functionality except media modules.

Fabric Management

Fabric Management: .....Simple Name Server, Alias Server, SNMP, the SANsurfer Web-based Java application

User Interface:.....LED indicators

Maintenance Interfaces: .....10/100BASE-T Ethernet

Ethernet Connector: RJ-45

Switch Mechanical

Chassis Dimensions: .....Refer to Figure A-1.

Enclosure Types: .....The chassis is shipped with four rubber feet on the bottom for secure stacking. Cabinet Mounting Brackets are also shipped with the chassis. You may mount these brackets for mounting the chassis in a Standard 19-inch EIA rack with either the chassis back or front facing the front of the equipment rack.

Chassis Support: .....Rack mount. No shelf or rails required.

Chassis Weight:.....9.090 kg (16 lbs) maximum configuration

Switch Electrical

Power source loading:.....1.3 Amps maximum at 90 to 137 Vac
0.7 Amps maximum at 180 to 265 Vac

Power Supply:.....115 Watts

Operating voltage:.....90 to 137 Vac; 47 to 63 Hz
180 to 265 Vac; 47 to 63 Hz

Input Fuse Type: .....There are two input fuses. Each fuse is a 2 Amp Slow-Blow, 250V Littelfuse P/N 218002 or equivalent

Switch Environmental

Operational Temperature: .....10 to 40°C (50 to 104°F)

Operating Humidity: .....25 to 80%, non-condensing

Operating Altitude: .....0 to 3048m (0 to 10,000 feet)

Operating Vibration: .....During/after (in any axis) of magnitude:
2.54mm (0.1”) from 5 to 14 Hz
0.1G from 14-300 Hz

Operating Shock: .....During/after (in any axis) of magnitude:
1.0G for 15 m seconds

Air flow:.....Cooling air flows from the front to the back or back to the front depending on the model.

Heat output:.....400 BTU/hr fully populated

Non-Operational Temperature: .....-40 to 65°C (-40 to 149F)

Non-Operating Humidity:.....25 to 90%, non-condensing

Non-Operating Altitude:.....0 to 15240m (0 to 50,000 feet)

Non Operating Vibration: .....(In any axis): 0.5G from 10 to 300 Hz

Non Operating Shock: .....(In any axis): 8.0G for 15 m seconds

Switch Regulatory Standards Certified to:

Safety Standards: UL1950
CSA 22.2 No. 950
EN60950

Emissions Standards: .....FCC Part 15B Class A
VCCI Class A ITE
CISPR 22, Class A
EN 55022, Class A

Voltage Fluctuations: .....EN 61000-3-3

Harmonics:.....EN 61000-3-2

Immunity:.....EN 50082-1:1997

Marking:.....FCC Part 15
UL (United States)
UL (Canada)
TUV
VCCI
CE

For more information refer to “Communications Statements” in the Preface.

Shortwave Laser GBIC (multi-mode)

Connector:	Duplex SC
Color coding:	Beige or black exposed connector surfaces
Cable:	Fibre Channel 100-M5-SN-I or 100-M5-SL-I (50um multimode) Fibre Channel 100-M6-SN-I or 100-M6-SL-I (62.5um multimode)
Wavelength:	770 - 860 nm
Open Fiber Control:	GBIC modules are standard with No-OFC. GBIC modules with OFC are only qualified from IBM® as SOC-1063.
Transmit Power:	-10dBm average
Receiver Sensitivity:	-16dBm average
Distance:	500 meters maximum using 50 micron fiber 300 meters maximum using 62.5 micron fiber
Safety:	DHHS 21 CFR(J), IEC 825-1, CENELEC EN 60825-1, VDE

Longwave Laser GBIC (single-mode)

Connector:	Duplex SC
Color coding:	Blue exposed connector surfaces
Cable:	Fibre Channel 100-SM-LC-L (9um single-mode)
Wavelength:	1270 - 1350 nm
Open Fiber Control:	GBIC modules are standard with No-OFC.
Transmit Power:	-10dBm average
Receiver Sensitivity:	-20dBm average
Distance:	2 meters to 10 kilometers
Safety:	DHHS 21 CFR(J), IEC 825-1, CENELEC EN 60825-1, VDE

Copper Inter-Enclosure GBIC (active)

Connector:.....Style 1 (9 pin D-subminiature, DB-9)
Style 2 (HSSDC, looks like wide phone jack or RJ45)
Fibre Channel 100-TW-EL-S (shielded dual parallel pair cable)
Fibre Channel 100-TP-EL-S (shielded dual twisted pair cable)

Differential Impedance: .....50 ohms +/- 10 ohms

Transmitted Signal .....1100 - 2000 mV differential PECL
Received Signal: .....400 - 2000 mV differential PECL

Distance: .....0 - 28 meters with 100-TP-EL-S

Cable .....0 - 33 meters with 100-TW-EL-S cable

Copper Intra-Enclosure GBIC (passive)

Connector:.....Style 1 (9 pin D-subminiature, DB-9)
Style 2 (HSSDC, looks like wide phone jack or RJ45)

Cable: .....Fibre Channel 100-TW-EL-S (shielded dual parallel pair cable)
Fibre Channel 100-TP-EL-S (shielded dual twisted pair cable)

Differential Impedance: .....150 ohms +/- 10 ohms

Transmitted Signal: .....600 - 2000 mV differential PECL

Received Signal: .....400 - 2000 mV differential PECL

Distance: .....0 - 11 meters with 100-TP-EL-S cable
0 - 13 meters with 100-TW-EL-S cable

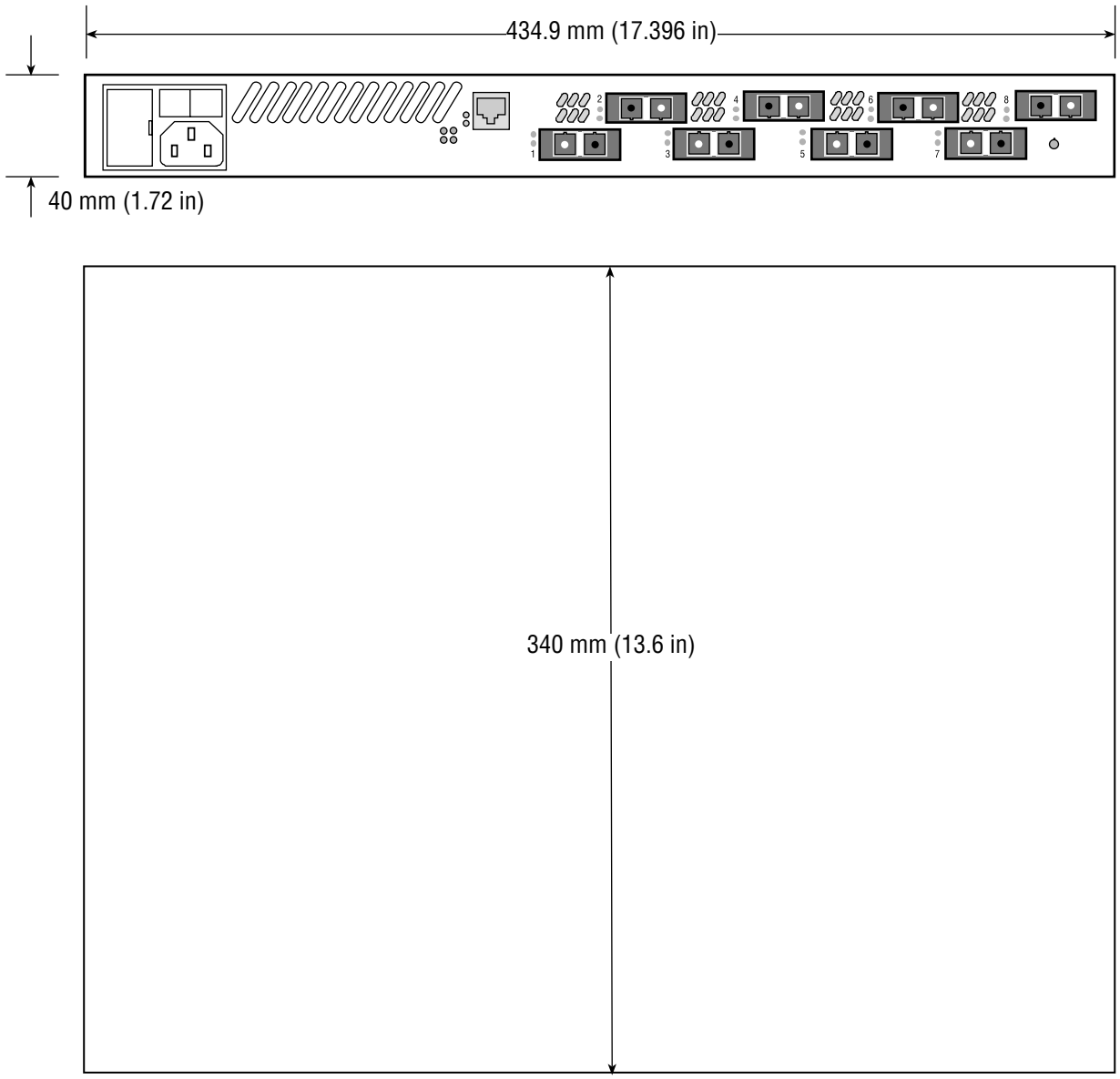


Figure A-1 SANbox-8 Switch Dimensions in Millimeters (Inches)

Notes

Glossary

Administrator

A user of the switch management program who can define switch parameters, but not user access.

Address Resolution Protocol

A protocol that enables systems to query the network to identify devices by internet address.

AL_PA

Arbitrated Loop Physical Address

Arbitrated Loop

A Fibre Channel topology where ports use arbitration to establish a point-to-point circuit.

Arbitrated Loop Physical Address (AL_PA)

A unique one-byte valid value assigned during Loop Initialization to each NL_Port on a Loop.

ARP

Address Resolution Protocol

ASIC

Application Specific Integrated Circuit

BootP

A type of network server.

Broadcast Zone

A group of ports that determine the recipient devices for broadcast messages.

Buffer Credit

A measure of port buffer capacity.

Class 2 Service

A service which multiplexes frames at frame boundaries to or from one or more N_Ports wit h acknowledgment provided.

Class 3 Service

A service which multiplexes frames at frame boundaries to or from one or more N_Ports without acknowledgment.

COF

CPORT Out FIFO

CPORT Out FIFO (COF)

A switch output buffer.

CRC

Cyclic Redundancy Check

Cyclic Redundancy Check (CRC)

A method of detecting small changes in blocks of data.

Ethernet Activity LED

A switch management connector LED that indicates when data is being transmitted to and from the Management Workstation.

Ethernet Link Status LED

A switch management connector LED that indicates an active link with the Management Workstation.

F_Port

Fabric port. A switch port that serves a public device.

Fabric Name

User defined name associated with the file that contains user list data for the fabric.

Fan Fail LED

An LED that indicates that a cooling fan in the switch is operating below standard.

FC-PLDA

Fibre Channel Private Loop Direct Attach

FL_Port

Fabric loop port. A switch port that serves a loop of public devices.

Flash Memory

Memory on the switch that contains the chassis control firmware.

Frame

Data unit consisting of a start-of-frame (SOF) delimiter, header, data payload, CRC, and an end-of-frame (EOF) delimiter.

FRU

Field Replaceable Unit

GBIC

GigaBit Interface Converter

GigaBit Interface Converter (GBIC)

A device, inserted into the switch chassis port, containing the transmitters and receivers that connect to the interconnection media.

Guest

A user of the switch management program who can view switch operations, but has no authority to define switch parameters or user access.

Hard Zone

A group of ports that provide access security by allowing communication only among hard zone member devices.

Heartbeat LED

An LED that uses blink patterns to indicate the status of the internal switch processor and the results of the Power-On-Self-Test.

Initiator

The device that initiates a data exchange with a target device.

In-Order-Delivery

A feature that requires that frames be received in the same order in which they were sent.

Input-Output Transfer

A switch stage type that enables the switch ports to connect to public devices, private devices, and other switches.

IO/T

Input-output transfer

IP

Internet Protocol

LIP

Loop Initialization Primitive Sequence

Logged-In LED

A port LED that indicates device login or loop initialization status.

Loop Initialization Primitive Sequence

A series of commands that initializes a loop of devices connected to a fabric.

Management Information Base

A set of guidelines and definitions for the Fibre Channel functions.

Management Workstation

PC or Unix workstation from which the switch is managed.

MIB

Management Information Base

NL_Port

Node Loop Port. A fibre channel device port that supports arbitrated loop protocol.

Non-Volatile Random Access Memory

Memory on the switch where configuration information is stored.

N_Port

Node Port. A fibre channel device port in a point-to-point or fabric connection.

NVRAM

Non-Volatile Random Access Memory

Over Temperature LED

An LED that indicates that air temperature inside the switch has exceeded a preset limit.

POST

Power-On-Self-Test

Power-On-Self-Test (POST)

Diagnostics that the switch chassis performs at start up.

Private Device

A device that can communicate only with other devices on the same loop.

Private Loop

A loop of private devices connected to a single switch port.

RARP

Reverse Address Resolution Protocol

Reverse Address Resolution Protocol

A protocol that enables systems to query the network to identify devices by their MAC address

SANsurfer

Web-based switch management application.

Segmented Loop

A set of private loops that behave as one private loop.

SL_Port

Segmented Loop Port. A port connected to a loop of private devices.

SL_Port Zone

A set of SL_Ports and their connected devices that behave as a single private loop.

SNMP

Simple Network Management Protocol

Stage Type

A parameter that determines how the ports of a switch are configured.

Switch Logic Power Good LED

An LED that indicates when power is being supplied to the switch.

Switch Management Connector

A connector port on the switch that provides Ethernet access for the Management Workstation.

Switch Name

User defined name for a switch

Super User

A user of the switch management program who has authority to define switch parameters and user access.

Target

A storage device that responds to an initiator device.

TL_Port

Translated loop port. A switch port that serves as a proxy enabling private devices to communicate with public devices.

T_Port

Trunk port. A switch port that connects to another switch.

Traffic LED

A port LED that indicates when frames are entering or leaving the port.

Update Flash

The act of loading switch firmware.

Trunk Port

See T_Port.

VCCI

Voluntary Control Council for Interference

World Wide Name (WWN)

A unique 64-bit address assigned to a device by the device manufacturer.

WWN

World Wide Name

Zone

A set of ports or devices that have been grouped together to control the exchange of information.

Index

A

AC power connector 1-18
air flow A-4
AL_PA - See Arbitrated Loop Physical Address.
altitude A-3
Application Specific Integrated Circuit 2-2
Arbitrated Loop Physical Address 1-3, 1-8
Arbitrated Loop Test Failure 3-8
ASIC - See Application Specific Integrated Circuit

B

back panel LEDs 1-16
bandwidth 2-1
broadcast zone 1-11
buffer credits 1-2, A-1

C

cable
  continuity tests 3-9
  length A-1
  types 2-3
cabling
  F_Ports 2-1
  FL_Ports 2-1
chassis
  air flow A-4
  back 1-13
  back panel controls 1-15
  dimensions A-3
  enclosure types A-3
  features 1-9
  heat output A-4
  marking A-4
  mechanical specifications A-3
  number 1-17
  Power-On-Self-Test 1-9
  shock A-3
  status 1-9
  support A-3
  vibration A-3
  weight A-3
classes of service A-1
Complete Failure 3-9
continuity test 3-9
copper inter-enclosure specifications A-5
copper intra-enclosure specifications A-6
credits 1-2, A-1

D

device types 2-1
diagnostics 3-1, A-2
dimensions A-3

E

emissions standards A-4
enclosure types A-3
environmental specifications A-3
error codes
  Arbitrated Loop Test Failure (13 Blinks) 3-8
  Complete Failure 3-9
  Ethernet Port Failure (4 blinks) 3-6
  Ethernet Port Tests Good (3 blinks) 3-6
  Force PROM Mode in Effect (5 Blinks) 3-6
  GBIC Bypass Test Failure (7 Blinks) 3-7
  Hung Flash Control Code 3-9
  NVRAM Test Failure (15 Blinks) 3-9
  Port Loop-back Test Failure (8 blinks) 3-7
  PROM Checksum Failure (1 blink) 3-6
  RAM Failure (2 blinks) 3-6
  Switch ASIC Test Failure (6 Blinks) 3-7
  Switch Auto-Route Test Failure (10 Blinks) 3-8
  Switch Bus Test Failure (9 Blinks) 3-8
  Switch Management Port Failure (14 Blinks) 3-9
Ethernet
  Activity LED 1-18
  connector 1-9, A-3
  LINK Status LED 1-18

F

F_Port 1-2
fabric
  aggregate bandwidth A-2
  component 1-1
  latency A-2
  management A-3
  point-to-point bandwidth A-2
Fabric Loop Port - See FL_Port.
Fabric Port
  description 1-2
  overview 1-3
Fan Fail LED 1-16

FC-PLDA - See Fibre Channel-Private Loop SCSI Direct Attach
Fibre Channel Port Loop-back Test Failure 3-7
fibre channel ports 1-13
Fibre Channel-Private Loop SCSI Direct Attach standard 1-4
Field Replaceable Unit 4-1
FL_Port
  description 1-2
  forced to operate as F_Port 2-1
Flash Checksum Failure/Ethernet Port Failure 3-6
Flash Checksum Failure/Ethernet Port Good 3-6
Force PROM Mode in Effect 3-6
frame size 1-2, A-2
FRU - See Field Replaceable Unit.
fuse
  part number A-3
  removal 4-2
  replacement 4-3
  type A-3

G

GBIC - See GigaBit Interface Converter
GBIC Bypass Port Loopback Test Failure 3-7
GigaBit Interface Converter
  copper inter-enclosure specifications A-6
  copper intra-enclosure specifications A-6
  longwave laser specifications A-5
  population 1-2
  removal 4-4
  replacement 4-5
  shortwave laser specifications A-5
  types certified 1-14

H

hard zone 1-11
harmonics A-4
Heartbeat LED
  description 1-16
  failure blink patterns 3-5
  normal operation 3-5
heat output A-4
humidity A-3
Hung Flash Control Code 3-9

I

immunity A-4
Input-Output/Transfer stage type 1-9
IO/T - See Input-Output/Transfer stage type

L

laser specifications A-5
latency 2-2, A-2
LED
  ethernet activity 1-18
  ethernet link status 1-18
  fan fail 1-16
  Heartbeat 1-16, 3-5
  logged-in 1-17
  over temperature 1-16
  switch logic power good 1-16
  traffic 1-17
Logged-In LED 1-17

M

MAC Address 1-18
maintainability A-2
maintenance
  interfaces A-3
  strategy A-2
marking A-4
mechanical specifications A-3
media type A-2

N

name server zones 1-11
NVRAM Test Failure 3-9

O

over temperature LED 1-16

P

port
  classes of service 1-2
  features 1-2
  groups 2-2
  Logged-In LED 1-17
  speed 1-2, A-2
  types 1-2
port types 2-2
POST - See Power-On-Self-Test.
power
  connector 1-18
  switch 1-15
Power Good LED 1-15
power source loading A-3
power supply
  specification A-3
  troubleshooting 3-1
Power-On-Self-Test 1-9, 3-2
PROM Checksum Failure 3-6
public device
  example 2-5
public loop example 2-4

R

RAID 2-6, 2-7
RAM Failure 3-6
reference information A-1
regulatory standards A-4
Reverse Address Resolution Protocol 1-10

S

safety standards A-4
segmented loop
  example 2-6
  features 1-4
  overview 1-3
  zone 1-11
Segmented Loop Port - See SL_Port.
segmented loop zone 1-4
shock A-3
Simple Network Management Protocol 1-12
SL Private Loop stage type 1-5, 1-9
SL_Port
  AL_PAs 1-4
  classes of service supported 1-5
  communication restrictions 1-5
  device discovery 1-4
  features 1-4
  frame types supported 1-5
  management 1-5
  number of 1-4
  number of devices 1-4
  number of segments 1-4
  overview 1-3
SNMP - See Simple Network Management Protocol
stage type 1-5
Switch ASIC Test Failure 3-7
Switch Auto-Route Test Failure 3-8
Switch Bus Test Failure 3-8
Switch Logic Power Good LED 1-16
switch management
  connector 1-18
  features 1-10
Switch Management Port Failure 3-9
switch specifications A-1
system processor A-2

T

T_Port 1-2
TCP/IP 1-7
temperature A-3
Test Mode switch 1-15, 3-2, 3-4
test/failure descriptions 3-6
TL_Port
  communication restrictions 1-8
  connectivity 1-5
  devices 1-5
  features 1-8
  frame support 1-8
  management 1-9
  name server registration 1-8
  number of devices 1-8
  number of off-loop devices 1-8
  overview 1-5
  private initiators 1-8
  private targets 1-8
  public initiator 1-6
  public targets 1-8
  topologies supported 1-6
  translation entries list 1-8
  zoning 1-8
Traffic LED 1-17
translated loop example 2-7
Translated Port - See TL_Port.
translation entries list 1-8
transmission ranges A-2
troubleshooting
  cable continuity 3-9
  power supply 3-1
Trunk Port - See T_Port.

U

user interface A-3

V

vibration A-3
voltage
  fluctuations A-4
  operating A-3

W

World Wide Name 1-10
WWN - See World Wide Name

Z

zoning 1-11

Notes